Serving the CoCo Community for
The RAINBOW 12 YEARS
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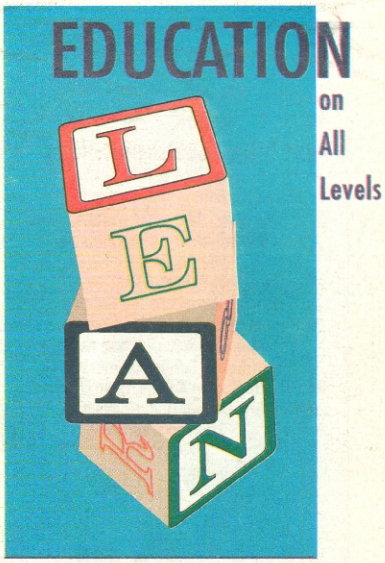

General Information

The Hitachi 6309:
A POWERFUL ALTERNATIVE

Most CoCo 3 owners wish there were some way they could alter their machines to make them run faster; while owners of PC compatibles have for years been buying faster and faster computers, the speed at which the CoCo executes programs has remained the same since the CoCo 3 was introduced.

Some OS-9 users and hardware hackers have been so desperate to squeeze additional performance out of the Color Computer that they've tried various bizarre and chancy hardware modifications — a few have gone so far as to install a faster clock crystal. (They *did* achieve roughly a 10-percent increase in speed, but at the expense of rendering most monitors useless with the CoCo because the timing of the video signal was also affected.) Such a modification is more a curious intellectual exercise than any kind of practical route to speeding up the CoCo 3.

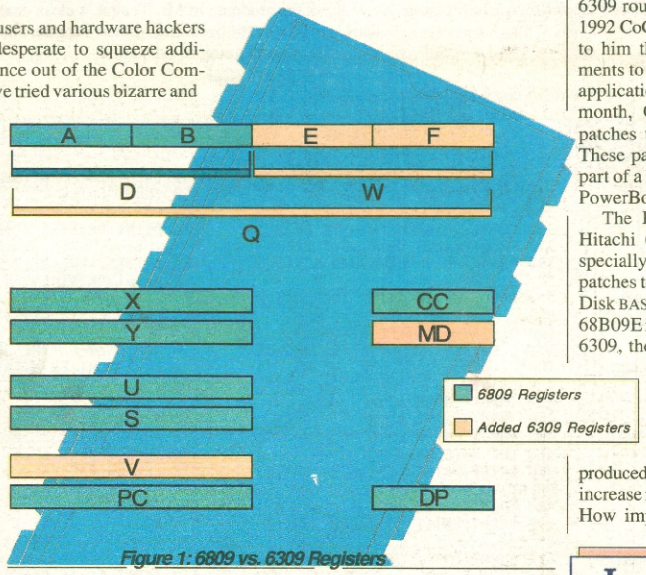

Figure 1: 6809 vs. 6309 Registers

Now, however, a sound and reliable means exists for speeding up program execution on the CoCo 3, at least under OS-9 Level II, by 10 to 30 percent (possibly up to 50 percent in the near future). This means is the Hitachi 6309 microprocessor, which is available through electronics parts houses and as part of a complete kit, called PowerBoost, sold by Burke & Burke (see the review, at right). The potential importance of the 6309 microprocessor to Color Computer users has come to light, thanks to the recent unofficial release of information about the chip.

The 6809 and the 6309: A History of the Technology

As most CoCo users know, the microprocessor used in the Color Computer 3 is the Motorola 68B09E. The 6809 family of microprocessors was engineered using

See 6309 on Page 15

Product Review

POWERBOOST:
SPEEDING UP THE COCO 3

Chris Burke learned of the hidden registers, instructions and modes of the Hitachi 6309 roughly a month before the Chicago 1992 CoCofest, and it immediately occurred to him that he could use these enhancements to make OS-9 software (system and applications) execute more quickly. In one month, Chris devised over 50 separate patches to modules in the OS-9 system. These patches have become an important part of a new product Burke & Burke calls PowerBoost.

The PowerBoost package includes a Hitachi 63B09E, a 40-pin socket and a specially formatted disk including the patches to OS-9, as well as some patches to Disk BASIC. The idea is that you replace the 68B09E in your CoCo 3 with the socket and 6309, then patch the software to take advantage of the new features, increasing the speed at which the CoCo 3 performs.

The patches Chris had devised prior to the Chicago show produced a noticeable and impressive speed increase in a CoCo 3 running OS-9 Level II. How impressive is impressive? A given `mdir e` took 8.75 seconds without the patches installed and 5.5 seconds with the patches — a 40-percent speed increase. In another test in which the CoCo 3 was asked to read a full megabyte of data from a hard drive it took 55.5 seconds without the patches and 39.5 seconds with the patches — again a throughput increase of about 40 percent. In a more dramatic (but less truly meaningful) demonstration, performing a `cobbler` to a RAM disk took 20 seconds without the patches and only 1.8 seconds with patches. What this would translate to for "cobblering" a floppy disk is dependent upon the efficiency of the data transfer from the system to the drive. It is important to note, too, that these figures represent performance increases while in the emulation mode of the 6309, not the native mode in which fewer instruction cycles are required.

The OS-9 patcher program Chris supplies is an exceptionally professional item. As it installs itself, it goes one by one through the modules, shows the user which modules it recognizes as patchable, and

See PowerBoost on Page 16

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Print#-2

A Promising Education

It is common knowledge that computers, CoCos included, are widely used in the field of education. But those of us without children, or whose children have finished their educations, often lose sight of just how important and effective the use of computers can be when combined with traditional educational methods. And there are several approaches that can be taken to enhance the educational process through the use of computers.

The most common strategy used today is the *drill* program, a program with which students are quizzed by the computer. Working much like flash cards, such programs are useful for teaching everything from simple math and spelling to anatomy and chemistry.

Another tactic is to first teach the given subject through traditional methods. Then after the students have a basic understanding of the subject, the computer is used to present concrete examples (proof) of the material learned. This approach is used by Louis Toscano in "The Electronic Blackboard" (THE RAINBOW, September 1987, Page 106). As he explains in that article, Mr. Toscano first introduces the concepts of calculus, then uses the CoCo to show the students how the graphs and equations relate in physical terms.

A third approach is to teach the material in a traditional manner, then let the students actually use what they have learned in a physical way. While it seems this method is used less frequently than the other two I've mentioned, it can be highly effective since the students are given some way to mentally base the material — they are given a tangible use for the material, reinforcing their learning efforts. This approach has been used by Bob Teague, a RAINBOW reader. We recently received the following letter from Mr. Teague and his algebra class:

Dear Sir:

I teach mathematics and science at Winthrop High School in Winthrop, Maine, where there are eight CoCos in the computer lab in my classroom. We receive THE RAINBOW and RAINBOW ON DISK each month, and many of the programs you have provided are integrated into my math and science courses. The CoCos are in constant use by my students.

During our study of solving equations in one unknown, I decided to challenge some of the students in my Algebra I course by having them create a program to solve equations in several forms. Once they understood how to solve the equations by hand, the students set about teaching the computer to solve the equations electronically through BASIC.

The work went slowly at first, but once the students got into the project, it proceeded quickly. Since many of the students had little programming experience, I helped with some of the mechanics of building a menu-driven program. The result is Equation Solver, which the class and I hope will inspire other algebra students to try their hands at programming. BASIC is alive and well in Mr. Teague's Period 1 algebra class.

Keep those great programs coming. We look forward to exploring the disk each month.

Sincerely yours,

Mr. Bob Teague and students:

Jaime Clark
Dana Fales
Levi Huntley
Crystal Pendexter
Barbie Williams
Frank Fitzgerald
Amy Phillips
Amy Bryant
Jess Shepard
Darcy Dunn
Ethan Foyt
Marty Matthews
Lynn Scribner
Eric Weber
Veronica Guimont
Mike Murphy
Ethan Savage

Enclosed with the letter was a disk containing the result of Mr. Teague's class's efforts, which I am printing here for your use and educational benefit.

I think the students in Mr. Teague's class deserve, at the very least, a big pat on the back, as does Mr. Teague. Their creation, after all, is the very meaning of education.

— Lonnie Falk

16K ECB

The Listing: EQUATION

```
1 'EQUATION SOLVER
2 '
3 'COPYRIGHT (C) 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 REM EQUATION SOLVING PROGRAM
20 REM BY PERIOD 1 ALGEBRA CLASS
 AND MR. BOB TEAGUE
30 CLS
40 PRINT"EQUASOLV ..... EQUATI
ON SOLVER"
50 PRINT"          M E N U"
60 PRINT
70 PRINT"     CHOOSE FORM:":PRIN
T
80 PRINT"     (1)  X+B=C"
90 PRINT"     (2)  AX=C"
100 PRINT"     (3)  AX+B=C"
110 PRINT"     (4)  X/A=C"
120 PRINT"     (5)  AX/B=C"
130 PRINT"     (6)  EXIT PROGRAM
"
140 PRINT
150 PRINT"     ENTER CHOICE (1-6
)"
160 INPUT C
170 IF C<1 OR C>6 THEN 150
180 ON C GOSUB 200,300,400,510,6
10,720
190 RUN
200 REM X+B=C TYPE SOLUTION
210 CLS:PRINT:PRINT"X+B=C SOLUTI
ON"
220 PRINT
230 INPUT"ENTER B";B
240 INPUT"ENTER C";C
250 LET X=C-B
260 PRINT:PRINT"X +";B;"=";C:PRI
NT
270 PRINT"VALUE OF X IS ";X
280 PRINT:PRINT"ENTER TO CONTINU
E"
290 INPUT C$:IF C$="" THEN RETUR
N
300 REM AX=C TYPE SOLUTION
310 CLS:PRINT:PRINT"AX=C SOLUTIO
N"
320 PRINT
330 INPUT"ENTER A";A
340 INPUT"ENTER C";C
350 LET X=C/A
360 PRINT:PRINT A;"X =";C:PRINT
370 PRINT"VALUE OF X IS ";X
380 PRINT:PRINT"ENTER TO CONTINU
E"
390 INPUT C$:IF C$="" THEN RETUR
N
400 REM AX+B=C TYPE SOLUTION
410 CLS:PRINT:PRINT"AX+B=C SOLUT
ION"
420 PRINT
430 INPUT"ENTER A";A
440 INPUT"ENTER B";B
450 INPUT"ENTER C";C
460 LET X=(C-B)/A
470 PRINT:PRINT A;"X +";B;"=";C:
PRINT
480 PRINT"VALUE OF X IS ";X
490 PRINT:PRINT"ENTER TO CONTINU
E"
500 INPUT C$:IF C$="" THEN RETUR
N
510 REM X/A=C TYPE SOLUTION
520 CLS:PRINT:PRINT"X/A=C SOLUTI
ON"
530 PRINT
540 INPUT"ENTER A";A
550 INPUT"ENTER C";C
560 LET X=A*C
570 PRINT:PRINT"X /";A;"=";C:PRI
NT
580 PRINT"VALUE OF X IS ";X
590 PRINT:PRINT"ENTER TO CONTINU
E"
600 INPUT C$:IF C$="" THEN RETUR
N
610 REM AX/B=C TYPE SOLUTION
620 CLS:PRINT:PRINT"AX/B=C SOLUT
ION"
630 PRINT
640 INPUT"ENTER A";A
650 INPUT"ENTER B";B
660 INPUT"ENTER C";C
670 LET X=(B*C)/A
680 PRINT:PRINT A;"X /";B;"=";C:
PRINT
690 PRINT"VALUE OF X IS ";X
700 PRINT:PRINT"ENTER TO CONTINU
E"
710 INPUT C$:IF C$="" THEN RETUR
N
720 CLS:END
```

Letters to the RAINBOW

Back on Track

Editor:

I just started my subscription to THE RAINBOW and am thrilled to see a magazine devoted to the Color Computer. After having my PC stolen, I wasn't ready to invest a major amount of money into another, then buy all the software again. So I took my CoCo 3 out of mothballs, plugged in several programs and rediscovered the CoCo magic.

Now, I'm investing in most of your advertisers to upgrade my computer to its full potential. A friend came over and watched me put the CoCo through some of its paces. He was impressed with its performance and color graphics (and he owns a 386-based PC).

I had almost forgotten the fun of writing my own programs — the sense of accomplishment and satisfaction from designing and debugging. I hope in the not-too-distant-future to submit short "fun" programs for RAINBOW readers. Until that time, your publication helps me in my search for all the tools and accessories available for my CoCo 3. Thank you for a fine monthly publication and a double kudos to your

readers and advertisers for keeping the CoCo alive.

C.J. Ryan
ST 3, USCGC Gallatin
Governors Island
New York, NY 10004

Needs a CoCo 3 Replacement

Editor:

We have four different types of computers in our household (Apple, Atari, TI and CoCo), and the CoCo is my favorite. Now my CoCo 3 is on the fritz, and I want another one. If one of your readers has a CoCo 3 he wouldn't mind parting with, I'd really appreciate hearing from him.

Jason Sikes
6209 NE 96th Avenue
Vancouver, WA 98662

Thanks for Scratching Our Backs

Editor:

Having worked in retail bookstore operations and purchasing for a number of years, I know the costs and problems involved in dealing with dealers and wholesalers, all in the name of "distribution." I have watched each month the shrinking size of THE RAINBOW, the format changes, the shrinking size of the advertising base, the letters and readers becoming more critical (and no doubt, loss of subscriptions), and the smaller size of articles and programs. The general public does not realize what it takes to get a publication in print or the money and time involved in getting it to the reader.

We are a dying breed out here, and you are our only stable contact. With everyone so quick to bail out on us, you seem to be trying to do anything and everything possible to continue your support to us. People are always very quick to criticize when they do not like something, but are not always so quick to help. These people need to be encouraged to support you more with suggestions, submissions and involvement with the only lifeline for their CoCos. They need to support the advertisers more, or they too will be gone — and subscriptions alone do not pay the bills. This is a readers' publication, and only by their input will it continue to be so.

After years of newsstand purchasing, I have finally subscribed. I also purchased a number of back issues — within two weeks they were here. I was one issue short, and with a quick call to your 800 number I was assured it would be on its way without delay. Please compliment your staff on the service they provided.

For what it is worth, you have my support and dollars as long as you need them. With my subscription, you pledged to support me with your magazine. In turn, my pledge is to try to be a better and more supporting reader in whatever way I can.

Peggy Johnson
490 Benjamin Moreau
Le Gardeur, Quebec J5Z 4L4
Canada

In Defense of the 68000

Editor:

I have never had any complaints with THE RAINBOW, but after reading "Print #-2" in the May 1992 issue, I want to give my opinion about the new OSK/68000-based computers.

I am very pleased with the service my CoCo has given me over the last three years, and I will keep it as long as it displays the Disk Extended BASIC message when I turn it on. But if I ever need to have more power, I would really like to use one of the new 68000-based computers. I have used MS-DOS, and I think OS-9 is more powerful. Besides, I am already familiar with OS-9 because I have used it on my CoCo.

In his May column, Lonnie said the main reason the new computers will not serve us well in the future is because of the lack of software. From what I have read in THE RAINBOW, the CoCo was in a similar position when it was introduced 12 years ago. There were only a few ROM Paks from Radio Shack and nothing more. It was the support and dedication of the CoCo Community that made the CoCo the great machine it is today.

If we give this same support and dedication to the companies and programmers developing software for the new machines, we will make the new computers as good as the CoCo, with the same variety in software and hardware. And the CoCo Community will continue to exist for many years to come, with THE RAINBOW right there with us. Thank you for letting me express my opinion.

Luis Tanon Garcia
P.O. Box 475
Naranjito, PR 00719

Adventurer Needs Help

Editor:

Help! How do I get that stupid parrot to eat the birdseed on the string in the game *Caladuril, Flame of Light*? Anyone who can help, please write to me.

Johnnie Hirst
P.O. Box 2092
Beeville, TX 78104

Do Unto Others . . .

Editor:

At first I didn't care for the new format of THE RAINBOW, and I seriously thought about not resubscribing. But after having the chance to get used to the new format, I like it. As other readers have pointed out, it is easier to read without the glare from the glossy pages. The ads are larger, and I find it much easier to handle while I read it.

Other people have valid points too, regarding the bulkiness and the awkwardness of storing THE RAINBOW. But people must realize that with time comes changes, and we must adapt to those changes.

Sometimes I get tired of reading letters in which people "cry" because of the new format or the reduced size. I wish these people would ask themselves, "What have I done to support THE RAINBOW recently? Have I submitted an article? Do I support the advertisers?"

Come on, people, get with it. If we lose our RAINBOW, we have nothing. Do your part. Support any way you can. All we need to do is stick together to keep the CoCo Community together. As John F. Kennedy might have said, "Ask not what your RAINBOW can do for you, ask what you can do for your RAINBOW."

Timothy Neihouse
P.O. Box 122
Beatty, NV 89003

Moving to a Hard Drive

Editor:

I have spent countless hours trying to install a variety of games and utilities on my CoCo 3's 10-Meg hard drive. Most have worked with only a few modifications, but some are just too stubborn. Can someone help me out? The problem programs are *Sub Battle Simulator* (Epyx), *Laser Surgeon* (Activision), *Flight Simulator II* (subLogic), *Donald Duck's Playground* and *Winnie the Pooh in the Hundred Acre Wood* (Sierra On-Line), and finally *Multi-Vue* (I can't even get it to recognize the hard drive as a floppy-based program).

With all the time I've spent on this, I also discovered something of interest: *Interbank Incident* and *Mickey's Space Adventure* will work on a hard drive under OS-9 Level II if you use a Level I boot disk. It is really handy not to have to flip through all those disks!

Finally, why do some of my games that use artifacted colors display the color green instead of red (when I press F1-Reset)? Is a chip frying out on me? This began happening only a month or so ago. My system includes a 512K CoCo 3, an MPI (not upgraded), a Magnavox 8CM-515, two DSDD 5¼-inch drives and a 10-Meg hard drive.

Jeffrey Hess
1305 Lawe Street-Lower
Green Bay, WI 54301

We're not quite sure where the problem is, but our first suggestion is that you play with the Color and Hue controls on the Magnavox monitor. It is very easy to get some "unusual" color combinations if these controls are little out of adjustment.

Looking for *Continued* Support

Editor:

Last December I received a CoCo 3. I was so pleased with its performance that I upgraded it to 512K. My shock came when I learned that this excellent machine has been discontinued by Tandy.

I need your help in finding materials (software, hardware, etc.) that will work with this system. I have been looking through my copies of THE RAINBOW and tried to contact the various merchants I dealt with for my CoCo 1. The majority of my letters are either returned or I am receiving responses that the companies are out of business. Would you please let me know who I can contact that is still offering services for this system.

John Maes
1789 Terrace Heights Lane
Reno, NV 89523

As you have found, many past advertisers and vendors of CoCo products are no longer in business. This unfortunate situation is what makes communication through such sources as THE RAINBOW and Delphi so important—there are many others out here who might be able to help. You should be able to contact any current advertiser, and users on Delphi may be able to point you in the direction of vendors who don't advertise in THE RAINBOW.

Stop the Presses

Editor:

Thank you for the information, programs and general assistance your magazine has provided me over the last 10 years. Although I'm not too crazy about your recent change to the tabloid format, THE RAINBOW is still very useful.

Since first getting into OS-9 about two years ago, I have been trying to figure out how to send printer codes to my DMP-107 from within OS-9. I recently discovered a simple command, `display`, that solves this problem. I'm sure experienced OS-9 users are already aware of this, but those who are still experimenting may find it useful.

To use `display`, enter the command followed by the various codes you want to send to the printer (to change fonts, styles, etc.), then redirect the output to the printer. The printer codes you want to send must be entered in hexadecimal format. For example, the following command changes the DMP-107 to elongated print:

```
display 1b e >/p
```

where 1b is Hex for 27 and e is Hex for 14. The `>/p` string tells OS-9 to send the output of this command to the printer.

I hope this information is useful to those readers who are still learning how much power they have with OS-9 on their CoCo.

Eugene Wilkinson, Jr.
230 Northway Park Road, Apt. #7
Machesney Park, IL 61111

Dynacalc sans Linefeed

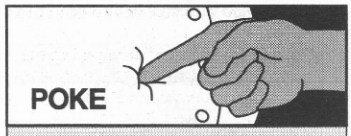
Editor:

Thanks for providing the patch to *Dynacalc* for eliminating the extra linefeed (May 1992, Page 2). Is there also a patch that would allow me to use the High Resolution Joystick Interface from Tandy?

John French
1619 Court Street
Redding, CA 96001

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, 9509 U.S. Hwy 42, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, enter `RAI` to get to the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, enter `LET` to reach the LETTERS> prompt, then select Letters for Publication. Be sure to include your complete name and address.



When writing educational software, it is important that your creations be as "goof-proof" as possible. There are several pokes that, when used on a CoCo 3 (or a 64K CoCo in the all-RAM mode), can help with this. To disable the CLEAR key, especially when a program is asking for user input, use `POKE 41893,0`. To restore CLEAR-key operation to normal, use `POKE 41893,129`. Similarly, to keep SHIFT-Backspace (SHIFT-left arrow) from erasing the entire current input line, use `POKE 41909,0`. To restore this, use `POKE 41909,21`.

Again, these pokes require that the CoCo on which they are used be in the all-RAM mode. Since the CoCo 3 is always in the all-RAM mode, this isn't a big problem for those users. Owners of 64K CoCo 1 and CoCo 2 machines can use the following short program to put their computers in the all-RAM mode prior to issuing the above pokes:

```
10 'ROMRAM
20 CLEAR 999
30 DATA 26,80,190,128,0,183,255,
222,166,128
40 DATA 183,255,223,167,31,140,2
24,0,37,241,57
50 FOR I=1TO21:READA$:A$=A$+CHR$
(A):NEXT I
60 P=VARPTR(A$)+1
70 POKE P,126
80 EXEC P
90 PRINT"BASIC IS NOW IN RAM"
```

Feature Program

To Hex With Decimal

While working with the Color Computer, I often need to convert numbers from the decimal (base 10) numbering system to hexadecimal (base 16). In the direct mode under Disk BASIC, this is easy to do using `PRINT HEX$(xxx)`. However, while a program is running, converting numbers isn't so simple a task. And now that I also use OS-9, it is even more of a bother. I wrote *Hex Chart* to end the frustration.

Hex Chart is a short BASIC program that prints a handy decimal/Hex conversion chart on paper. Though you may still need a pencil and paper for some simple math, the printed chart facilitates conversions. *Hex Chart* requires 16K and Extended BASIC, and the program is designed to work with any standard printer. If you have a CoCo 3 and want *Hex Chart* to print to the screen instead, change all `PRINT#-2,` statements to `PRINT` and set the screen width to 80 columns. [*Editor's Note: While you can change* Hex Chart *to print to the screen, a more efficient approach would be to run a stand-alone conversion program such as presented in "Base Conversions" (July 1992, Page 4) by George Quellhorst.*]

Now let's look at how to use the printed chart (see Figure 1) to convert numbers. As an example, we'll convert the decimal number 46,253 to hexadecimal. First, find on the chart the highest number that is equal to *or less than* the original number. In our example, the number on the chart would be 45,056, which appears in Column 4 and has the Hex digit $B to its left. Now subtract the decimal number on the chart from the original number. In this case, the difference is 46,253 - 45,056, or 1197. Again refer to the chart, this time looking for the highest number that is equal to or less than this difference. The decimal value 1024 in Column 3 fits this, and the Hex digit to its left is $4.

Again subtracting the chart number from the number we are converting (1197 - 1024), we find a difference of 173. Going to the chart, we find the highest number equal or less than 173 is 160 in Column 2, giving us a Hex digit of $A. The final difference, 173-160, is 13. This number is in Column 1 and correlates to the Hex digit $D. So the decimal number 46,254 is the same as $B4AD.

Note that the columns from which we take our hexadecimal digits directly represents the position of the digit in the converted number. When converting a number that exactly matches one in Column 2, 3, 4 or 5 on the chart, don't forget to add the significant zeroes. For example, in converting 32,768 from decimal to Hex, you'll find this number in Column 4 with a Hex digit of $8. After subtraction, we are left with zero. So you need to put three zeroes (for columns 3, 2 and 1) after the $8, giving a final converted value of $8000.

The chart printed by *Hex Chart* is also very useful for converting numbers from hexadecimal to decimal. Simply reverse the process. For example, starting with $12C, you would look up the decimal equivalents in the appropriate columns for each of the Hex digits. These numbers, in the correct position, are 256, 32 and 12. Now add the numbers together to get the final result, decimal 300.

Steve Ricketts is a mainframe computer operator for a firm in the Portland area. Steve's greatest CoCo interests are graphics and telecommunications, and he is now beginning to delve into the world of OS-9. He and his wife Debbie are the proud parents of three daughters. He can be contacted at P.O. Box 1048, Fairview, OR 97024. Please include an SASE when requesting a reply.

```
 ---------------------------------------------------------
!          Decimal to Hex Conversion Help Chart           !
!---------------------------------------------------------!
!---------------------------------------------------------!
! 0      0 ! 0      0 ! 0      0 ! 0      0 ! 0      0 ! 0 !
! 1  65536 ! 1   4096 ! 1    256 ! 1     16 ! 1      1 ! 1 !
! 2 131072 ! 2   8192 ! 2    512 ! 2     32 ! 2      2 ! 2 !
! 3 196608 ! 3  12288 ! 3    768 ! 3     48 ! 3      3 ! 3 !
! 4 262144 ! 4  16384 ! 4   1024 ! 4     64 ! 4      4 ! 4 !
! 5 327680 ! 5  20480 ! 5   1280 ! 5     80 ! 5      5 ! 5 !
! 6 393216 ! 6  24576 ! 6   1536 ! 6     96 ! 6      6 ! 6 !
! 7 458752 ! 7  28672 ! 7   1792 ! 7    112 ! 7      7 ! 7 !
! 8 524288 ! 8  32768 ! 8   2048 ! 8    128 ! 8      8 ! 8 !
! 9 589824 ! 9  36864 ! 9   2304 ! 9    144 ! 9      9 ! 9 !
! A 655360 ! A  40960 ! A   2560 ! A    160 ! A     10 ! A !
! B 720896 ! B  45056 ! B   2816 ! B    176 ! B     11 ! B !
! C 786432 ! C  49152 ! C   3072 ! C    192 ! C     12 ! C !
! D 851968 ! D  53248 ! D   3328 ! D    208 ! D     13 ! D !
! E 917504 ! E  57344 ! E   3584 ! E    224 ! E     14 ! E !
! F 983040 ! F  61440 ! F   3840 ! F    240 ! F     15 ! F !
!---------------------------------------------------------!
!(Hex Pos 5)(Hex Pos 4)(Hex Pos 3)(Hex Pos 2)(Hex Pos 1)!
 ---------------------------------------------------------
```

Figure 1: Printed Conversion Chart

16K Extended

The Listing: HEXCHART

```
1 'DECIMAL/HEX HELP CHART
2 'BY STEVE RICKETTS
3 'COPYRIGHT (C) 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
100 PRINT#-2," ";STRING$(54,"-")
110 PRINT#-2, "!         Decimal
 to Hex Conversion Help Chart
     !"
120 PRINT#-2,"!";STRING$(54,"-")
;"!":H1=65536:H2=4096:H3=256:H4=
16:H5=1
140 PRINT#-2,"!";STRING$(54,"-")
;"!"
150 PRINT#-2,"!";
160 FOR L=0 TO 15
170 FOR C=1 TO 5
180  PRINT#-2," ";HEX$(L);
190 IF C=1 THEN PD=L*H1 ELSE IF
C=2 THEN PD=L*H2 ELSE IF C=3 THE
N PD=L*H3 ELSE IFC=4 THEN PD=L*H
4 ELSE IFC=5 THEN PD=L*H5
200 PS=LEN(STR$(PD))-1
210 PRINT#-2, STRING$(6-PS," ");
PD;"!";
220 IF C/5=INT(C/5)THENPRINT#-2,
"":IFL=15 AND C=5 THEN 240 ELSEP
RINT#-2,"!";
230 NEXTC:NEXTL
240 PRINT#-2,"!";STRING$(54,"-")
;"!"
250 PRINT#-2,"!(Hex Pos 5)(Hex P
os 4)(Hex Pos 3)(Hex Pos 2)(Hex
Pos 1!"
260 PRINT#-2," ";STRING$(54,"-")
```

Feature Program

Scramble for the Letters

Scramble is a guessing game designed for any CoCo with at least 16K and Extended BASIC. It is the first game I wrote for the CoCo, and despite its simplicity, is actually quite enjoyable.

When you run *Scramble*, the computer picks a string of three letters. The object of the game is to guess the sequence the computer has picked. Make your guess by typing three letters and pressing ENTER. The computer then compares your guess to the three-letter string it picked and tells you how close your guess is. It does this by printing a string consisting of X's, @'s and *'s. An X indicates the letter you guessed for that position is correct and in the right position in the computer's scramble. An @ means the letters is in the scramble but in another position, and an * means it is not in the scramble at all.

As written, you have 20 attempts at guessing the computer's scramble. This number is set by the statement `IF GG=20` in Line 140. You can change the number of guesses allowed by changing 20 to another number. Another modification you might try is to have the program reduce the number of guesses allowed after each time you correctly guess a scramble. Whether or not you modify the program, I hope you have fun with *Scramble*.

Trevor Boehm is a tenth-grade student whose greatest passion is challenging computers with new programs. He has participated in several science fairs and has received numerous awards for his work. He can be contacted at 77 Inwood Cres., Winnipeg, MB R2Y 1A2, Canada. Please include an SASE when requesting a reply.

16K Extended

The Listing: SCRAMBLE

```
1 'SCRAMBLE
2 'BY TREVOR BOEHM
3 'COPYRIGHT (C) 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 CLS:PLAY"O1L8CDEFG":PRINT"
     S C R A M B L E      "
20 PRINT:PRINT"I AM THINKING OF
SCRAMBLE OF 3":PRINT"LETTERS.
YOU HAVE 20 GUESSES  TO SOLVE MY
 SCRAMBLE. AFTER EACHOF YOUR GUE
SSES I WILL TELL YOU HOW WELL YO
U DID BY PRINTING A  SET OF *'S,
 X'S, & @'S. X'S MEANTHAT A LETT
ER IS IN THE CORRECT"
30 PRINT"POSITION AND @'S MEAN T
HAT THE  LETTER IS IN THE SCRAMB
LE BUT ISINCORRECTLY POSITIONED.
 A * IS ABLANK"
40 EXEC44539
50 W=RND(-TIMER)
60 FORWD=1TO3:AC=RND(26)+64:WD$(
WD)=CHR$(AC):NEXT
70 SC$=WD$(1)+WD$(2)+WD$(3):GG=1
80 CLS:PRINT"GUESS";GG:INPUTGG$:
GG=GG+1
90 IFGG$=SC$THENGOTO150
100 GP$(1)=LEFT$(GG$,1):GP$(2)=M
ID$(GG$,2,1):GP$(3)=RIGHT$(GG$,1
)
110 IFGP$(1)=WD$(1)THENRS$(1)="X
"ELSEIFGP$(1)=WD$(2)THENRS$(1)="
@"ELSEIFGP$(1)=WD$(3)THENRS$(1)=
"@"ELSERS$(1)="*"
120 IFGP$(2)=WD$(2)THENRS$(2)="X
"ELSEIFGP$(2)=WD$(1)THENRS$(2)="
@"ELSEIFGP$(2)=WD$(3)THENRS$(2)=
"@"ELSERS$(2)="*"
130 IFGP$(3)=WD$(3)THENRS$(3)="X
"ELSEIFGP$(3)=WD$(1)THENRS$(3)="
@"ELSEIFGP$(3)=WD$(2)THENRS$(3)=
"@"ELSERS$(3)="*"
140 PRINTRS$(1);RS$(2);RS$(3):FO
RX=1TO1000:NEXT:IFGG=20THENGOTO1
60ELSEGOTO80
150 FORA=1TO12:PLAYSTR$(A):NEXT:
PRINT"CORRECT ! ! !":FORA=1TO100
0:NEXT:RUN
160 FORX=0TO2:FORY=12TO1STEP-1:P
LAYSTR$(Y):NEXT:NEXT:PRINT"YOU'V
E RAN OUT OF GUESSES ! ! !":FORX
=1TO1000:NEXT:RUN
```

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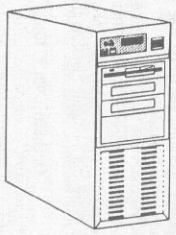

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Feature Program

OS-9 Learns to Count

When writing, it is often important to know just how long your creation is. *Count* is an OS-9 version of the UNIX wc utility, which counts the number of lines, words and characters in text files.

The syntax for *Count* is:

```
count [-lwc] [filename] [...]
```

To use the program, enter `count` followed by the desired options (if any) and the name or pathlist of the file for which you want the count. As the ellipsis (...) indicates, you can enter several filenames or pathlists to count many files in one pass.

The options available with *Count* are shown in Figure 1. You can enter them in any order, together following a single hyphen (`-cw`) or separately using spaces (`-c -w`). If no options are specified, *Count* defaults to all three — as if you entered `-lwc`.

`-l`	count text lines
`-w`	count words
`-c`	count characters

Figure 1: Count Options

When *Count* goes through a text file, a line is counted each time the program encounters a carriage return or linefeed character in the file. A word is considered to be any string of characters that is bracketed by spaces, carriage returns, linefeeds or any combination of these. The characters counted by *Count* are the printable characters only and do not include spaces, carriage returns or linefeed characters.

The counts for each file specified are displayed on a single line in the order lines, words, characters and filename. For example, if you enter `count myfile`, you'll see something like

```
313    1404    8454    myfile
```

appear onscreen. If you use *Count* with multiple files, the combined totals of all the files are displayed following the individual file counts. Entering

```
count -lc chapter1 chapter2
```

results in the following display:

```
313      8454    chapter1
125      3068    chapter2
438     11522    total
```

If you don't specify any filenames on the command line, the standard-input path is used and *Count* accepts text from a pipeline or by input redirection. For example, you could enter

```
list file1 file2 ! count -l
```

to count the total number of lines contained in `file1` and `file2` together. The output of the list command is "piped" through the *Count* utility.

If you don't have an OS-9-based assembler, use the BASIC09 program in Listing 2 to generate the executable *Count* program. Those using OS-9 Level I also need to change all occurrences of `/dd` to `/d0` (or another appropriate drive) in the BASIC09 listing before running it.

Stephen Goldberg is a dentist and the author of the Utilipak *series of OS-9 utilities. He can be contacted at 695 Plainview Road, Bethpage, NY 11714. Please include an SASE when requesting a reply.*

OS-9

Listing 1: `Count.asm`

```
*******************************************
*
* COUNT -  (c) 1987 by STEPHEN B. GOLDBERG
*
* Use: count [-lwc] [filename] [...]
*      -l = count lines
*      -w = count words
*      -c = count characters
*      no options = count all
*
         ifp1
         use   /dd/defs/os9defs
         endc
*
         mod   len,name,prgrm+objct,reent+2,entry,dsiz
*
pointer  rmb   2              parameter pointer
path     rmb   1              input path number
totflag  rmb   1              total flag
options  rmb   1              option bit flag
textend  rmb   2              end of text block
lines    rmb   7              line count field
linesend rmb   9              end of line count field
wordsend rmb   9              end of word count field
charsend rmb   2              end of character count field
countall rmb   27             totals fields
prebuf   rmb   1              previous last character
buffer   rmb   2098           text buffer
         rmb   200            stack
         rmb   200            parameters
dsiz     equ   .
*
```

Product Review

Bible Programs and Instructional Programs: The CoCo Schoolhouse

Educational software offerings have become fairly limited in the current CoCo market, so when one comes along, it is usually picked up quickly by those who are looking for this type program. Sebastian LaSpada's newest products, *Bible Programs* and *Intructional Programs*, should prove to be no exception. Each of the two products is a cohesive package of related programs designed for education. In the case of *Bible Programs*, obviously the teaching is of a religious nature. The programs supplied in the two packages work with any CoCo with at least 32K.

Bible Programs comes on disk and contains several Bible quizzes and two adventure programs. Following is a brief description of the included programs:

Bible Scriptures: displays a short verse (or two) from the Bible — you must supply the appropriate book, chapter and verse numbers for the given verse. Supports over 50 questions.

Bible Scriptures (multiple choice): works just like the program above but is presented in a multiple-choice format. This version supports 70 questions.

Bible Questions, Part 1: provides 80 multiple-choice questions of a general nature (books of the Bible, locations, events, etc.).

Bible Questions, Part 2: provides 60 multiple-choice questions about people in the Bible and events in their lives.

Bible Questions, Part 3: offers 50 questions (also multiple-choice) of a "who said these words" nature.

The Promised Land: a text quiz/adventure based on the 40-year journey of the Israelites from Egypt to the Promised Land. You are asked to answer questions about the journey, and you must answer each question correctly to visit the Promised Land. A wrong answer takes you back to the beginning of the adventure. You'll probably need a map of the Israelites' journey to succeed — such a map is printed in the back of most Bibles.

A Bible Adventure: a text adventure that will take you through many scenes and events in the Bible. The program follows the standard text-adventure format, supporting two-word commands and single-letter directions (though two supported commands not found in most other adventure programs, `PRAY` and `STUDY`, will be helpful). A map and clue set is available from Sebastian LaSpada for $3.

Intructional Programs offers software of a more general educational nature. Included are:

Vocabulary: given a brief definition, you must select the correct word from a list of four. This multiple-choice quiz is very similar to *Readers Digest*'s "It Pays to Enrich Your Word Power." Includes 100 questions.

Math Quiz: presents 10-question rounds in your choice of five areas: addition, subtraction, multiplication, division and the times tables. Supports four levels in each area.

Homonyms: displays a sentence with a blank, which you must fill using one of two words that are homonyms (e.g., dear and deer). Supports 100 questions.

Spelling: in an interesting twist, this program works just like homonyms except that the two words are not homonyms. Rather they are the same, though one is misspelled. The program often supplies clues to the correct spelling when the user chooses an incorrectly spelled word.

Guess the Computer's Number: guess the number (from 1 to 100) that the computer has picked. This program is intended to teach relationships between numbers. Unfortunately it exhibits a confusing inconsistency: When I guessed 50, I was told "That is too small!" I then guessed 75 and was told "You're almost there!" So I guessed 85 and got "Still too big, but closer!" Since I thought I was coming up on the chosen number from below, I was surprised to see the word *still* in that last message. Where did I go wrong? Was 75 the first "too big" quess, or was it 85? (The chosen number in this case was 72.)

All the programs in the *Bible Programs* and *Instructional Programs* packages use sound and video for an effective presentation — correct answers are rewarded with a flashy block-graphics display. In addition, when an incorrect answer is entered, the programs provide the correct answer, which I think is an important part of the learning process.

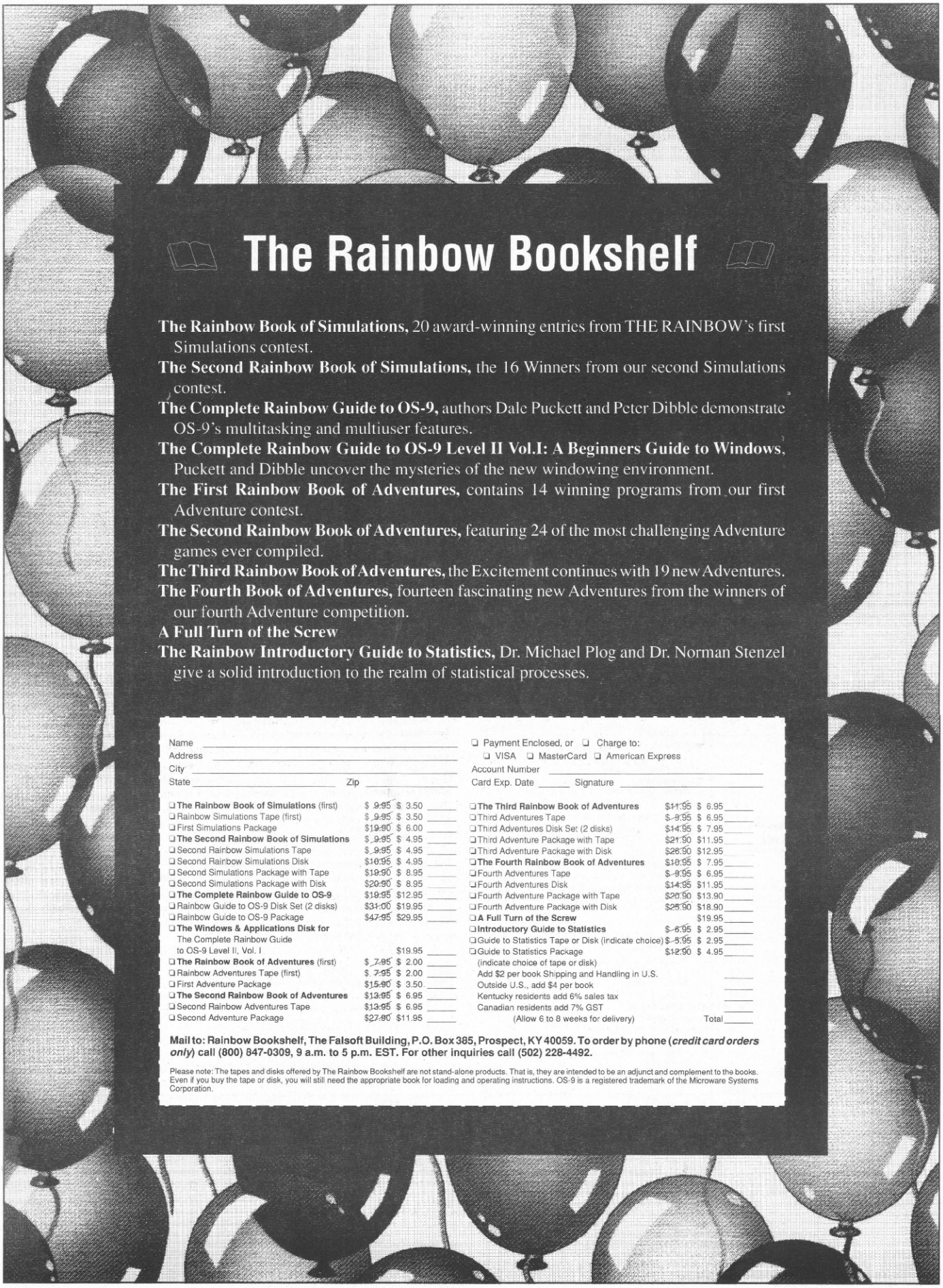
Though they enhance the presentation of the programs, I sometimes felt the sound and visual effects were a little overdone. It takes a while for some of them to stop before you can move on. I was especially annoyed when I thought the programs were waiting for me to press a key, only to find out they interpreted that keypress as my next answer, causing me to miss a few questions accidentally. To the author's credit, this is explained thoroughly in the manual, but it is hard to get used to in practice. Perhaps the displays could be shortened, or the author could alter the programs to ignore any keystrokes until they are requested.

An important aspect of educational programs is their ability to be modified as the needs and educational level of the user increases. With the exception of Math Quiz and the two adventures, it is possible to modify the questions and answers in all of the above programs simply by changing `DATA` statements. Though the formats of the `DATA` statements are not explicitly covered in the manual, it should prove to be fairly easy for anyone with a basic understanding of BASIC to alter them.

The material presented in these two packages of educational programs is appropriate for users in and beyond the grade-school level. Even many adults will be challenged, especially by the two Bible adventures.

All in all, *Bible Programs* and *Instructional Programs* are well-designed and easy to use. I recommend them for anyone interested in the study of the Bible and/or traditional education. Both packages are very reasonably priced, allowing even those with a modest income to take advantage of them. (Sebastian LaSpada, 531 Main Street, Dunkirk, NY 14048, 716-366-5261; *Bible Programs*, $12; *Instructional Programs*, $10; together, $19.)

— Cray Augsburg



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```
name     fcs   /Count/
         fcb   3             edition number
         fcc   /(c)1987 S.B.Goldberg/
*
format   fcc   /0000000  /
         fcb   0
*****************************
* INITIALIZE
*****************************
entry    clr   totflag       clear total flag
         clr   path          standard input path
         lda   #7            set all option bit flags
         ldb   ,x+           parameter character
         cmpb  #'-           options?
         bne   findname      no, check for filename
         clra                clear option bit flag
optnchar ldb   ,x+           next parameter character
         bra   chkoptn       check and set options
optnloop ldb   ,x+           parameter character
         cmpb  #$20          end of options?
         bls   findname      yes, check for filename
chkoptn  orb   #$20          make lower case
         cmpb  #'l           want line count?
         bne   checkw        no, check for words option
         ora   #1            set line flag bit
         bra   optnloop      look for more
checkw   cmpb  #'w           want word count?
         bne   checkc        no, check for char option
         ora   #2            set word flag bit
         bra   optnloop      look for more
checkc   cmpb  #'c           want character count?
         lbne  syntxerr      invalid option, prompt and quit
         ora   #4            set character flag bit
         bra   optnloop      look for more
findloop ldb   ,x+           next parameter character
findname cmpb  #$20          filename?
         beq   findloop      no, look some more
         cmpb  #'-           hyphen?
         beq   optnchar      yes, check for another option
         leax  -1,x          no, reset filename pointer
         sta   options       save options flag byte
         ldb   #3            six count fields (include total)
zerofile addb  #3            three count fields (file only)
         pshs  x             save parameter pointer
         leax  lines,u       data display area
initloop leay  <format,pcr   data field format
moveloop lda   ,y+           field character
         beq   endcheck      branch if end of field
         sta   ,x+           else move to data area
         bra   moveloop      get another character
endcheck decb                all fields initialized?
         bne   initloop      no, do another field
*****************************
* OPEN FILE FOR TEXT INPUT
*****************************
         ldx   ,s            filename pointer
         lda   ,x            get character
         cmpa  #$0d          filename?
         beq   savpoint      no, use standard input
         lda   #read.        read mode
         os9   i$open        open file
         lbcs  cantopen      message on error
         sta   path          save input path number
         inc   totflag       count the file
         lda   #$0d          carriage return
         cmpa  ,x            end of parameters?
         beq   savpoint      yes, save the pointer
         sta   -1,x          no, CR to end of filename
savpoint stx   pointer       save next filename pointer
*****************************
* READ AND COUNT TEXT BLOCK
*****************************
gettext  sta   prebuf        save last character
         leax  buffer,u      start of buffer
         ldy   #2098         maximum text length
         lda   path          input path number
         os9   i$read        get text
         bcs   error         branch on error
         tfr   x,d           buffer address
         leay  d,y           add to text length
         sty   textend       save end of text address
getchar  cmpx  textend       end of text block?
         beq   gettext       yes, get next block
         lda   ,x+           get character
         cmpa  #$20          printable character?
         bhi   chrcount      yes, count character
         ldb   -2,x          check preceding character
         cmpb  #$20          end of word?
         bls   lincount      no, check for new line
         leay  wordsend,u    word count field
         bsr   count         count word
lincount cmpa  #$20          space?
         beq   getchar       yes, don't count it
         leay  linesend,u    line count field
         bra   docount       count line
chrcount leay  charsend,u    character count field
docount  bsr   count         count character
         bra   getchar       get next character
count    pshs  y             save field pointer
         bsr   count1        increment count
         puls  y             retrieve field pointer
         leay  27,y          total field pointer
count1   ldb   ,-y           get digit
         incb                add 1
         cmpb  #'9           more than 9?
         bls   save          no, save it
         ldb   #'0           yes, make it zero
         stb   ,y            save it
         bra   count1        carry to next digit
save     stb   ,y            save digit
         rts                 return
*****************************
* DISPLAY COUNT OR TOTAL
*****************************
error    cmpb  #e$eof        end of file?
         bne   out           exit with other error
         lda   path          input path number
         bne   close         not standard input, close file
         leax  <standin,pcr  standard input pointer
         bra   namesave      display standard input count
close    os9   i$close       close file
         bcs   out           exit with error
         leax  lines,u       start of display
dototal  ldb   options       get option bit flag
display  lsrb                check field flag
         pshs  b             save options flag
         bcc   nxtfield      omit this field
         ldb   #6            digit count
         tfr   x,y           field pointer
zerozap  lda   ,y+           get digit
         cmpa  #'0           zero?
         bne   seefield      no, send field to screen
         lda   #$20          yes, get space
         sta   -1,y          zap leading zero with space
         decb                done?
         bne   zerozap       no, check next digit
seefield ldy   #9            field size
         bsr   print1        write field to screen
nxtfield leax  9,x           point to next field
         ldb   ,s+           all fields displayed?
         bne   display       no, display next field
nameit   puls  x             pathname/total pointer
         bsr   print         pathname/total to screen
         clrb                clear error
         ldx   pointer       parameter pointer
         lda   ,x            next parameter character
         cmpa  #$0d          another filename?
         lbne  zerofile      yes, count next file
         dec   totflag       more than one file?
         bgt   totalit       yes, display total
out      os9   f$exit        quit
totalit  leax  <total,pcr    total pointer
namesave pshs  x             save total or std input pointer
         leax  countall,u    total display
         clr   totflag       indicate end of program
         bra   dototal       display totals or std input
*
standin  fcc   /standard input/
         fcb   $0d
total    fcc   /total/
         fcb   $0d
*
print    ldy   #200          maximum length
print1   lda   #1            standard output path
         os9   i$writln      print it
         bcs   out           exit with error
         rts                 return
*****************************
* ERROR MESSAGES
*****************************
cantopen leax  <cant,pcr     can't open message
         ldy   #cantlen      message length
         bsr   print1        message to screen
         ldx   ,s            filename pointer
skipfile lda   ,x+           filename character
         cmpa  #$20          valid character?
         bhi   skipfile      yes, look again
         blo   savenext      end of parameters, save it
         lda   #$0d          carriage return
         sta   -1,x          to end of filename
findnext lda   ,x+           character
         cmpa  #$20          next parameter?
         beq   findnext      no, look again
savenext leax  -1,x          yes, reset pointer
         stx   pointer       save it
         bra   nameit        filename to screen
*
syntxerr leax  <syntax,pcr   syntax prompt
         bsr   print         prompt to screen
         clrb                clear error
         bra   out           quit
*
cant     fcc   /**** Can't open: /
syntax   fcb   7             bell
cantlen  equ   *-cant
         fcc   /Use: count [-lwc] [file] [...]/
         fcb   $0d
*
         emod
len      equ   *
         end
```

Listing 2: MakeCount.b09

```
PROCEDURE MakeCount
 0000       (* Generates the binary module count *)
 0027       (* level I - change all /dd to /d0 *)
 004C       DIM path,byt:BYTE
 0057       DIM count:INTEGER
 005E       PRINT "Creating count . . .";
 0077       CREATE #path,"/dd/cmds/count":WRITE
 0090       FOR count=1 TO 469
 00A1         READ byt
 00A6         PUT #path,byt
 00B0       NEXT count
 00BB       CLOSE #path
 00C1       PRINT
 00C3       SHELL "attr /dd/cmds/count e pe"
 00DF       END
 00E1       DATA 135,205,1,213,0,13,17,130,255,0,49,10,0,67,111,117
 0115       DATA 110,244,3,40,99,41,49,57,56,55,32,83,46,66,46,71,111
 014C       DATA 108,100,98,101,114,103,48,48,48,48,48,48,48,32,32,0
 0180       DATA 15,3,15,2,134,7,230,128,193,45,38,41,79,230,128,32
 01B4       DATA 6,230,128,193,32,35,30,202,32,193,108,38,4,138,1,32
 01E8       DATA 240,193,119,38,4,138,2,32,232,193,99,16,38,1,57,138
 021C       DATA 4,32,222,230,128,193,32,39,250,193,45,39,208,48,31
 024D       DATA 151,4,198,3,203,3,52,16,48,71,49,140,170,166,160,39
 0281       DATA 4,167,128,32,248,90,38,242,174,228,166,132,129,13,39
 02B2       DATA 21,134,1,16,63,132,16,37,0,221,151,2,12,3,134,13,161
 02E9       DATA 132,39,2,167,31,159,0,151,61,48,200,62,16,142,8,50
 031D       DATA 150,2,16,63,137,37,68,31,16,49,171,16,159,5,156,5,39
 0354       DATA 229,166,128,129,32,34,19,230,30,193,32,35,5,49,200
 0385       DATA 23,141,15,129,32,39,231,49,78,32,3,49,200,32,141,2
 03B9       DATA 32,220,52,32,141,5,53,32,49,168,27,230,162,92,193,57
 03ED       DATA 35,6,198,48,231,164,32,243,231,164,57,193,211,38,71
 041E       DATA 150,2,38,5,48,140,79,32,68,16,63,143,37,57,48,71,214
 0455       DATA 4,84,52,4,36,23,198,6,31,18,166,160,129,48,38,7,134
 048C       DATA 32,167,63,90,38,243,16,142,0,9,141,65,48,9,230,224
 04C0       DATA 38,222,53,16,141,51,95,158,0,166,132,129,13,16,38,255
 04F4       DATA 50,10,3,46,3,16,63,6,48,140,24,52,16,48,200,34,15,3
 052E       DATA 32,186,115,116,97,110,100,97,114,100,32,105,110,112
 055C       DATA 117,116,13,116,111,116,97,108,13,16,142,0,200,134,1
 058D       DATA 16,63,140,37,209,57,48,140,40,16,142,0,18,141,239,174
 05C1       DATA 228,166,128,129,32,34,250,37,10,134,13,167,31,166,128
 05F2       DATA 129,32,39,250,48,31,159,0,32,154,48,140,22,141,204
 0623       DATA 95,32,165,42,42,42,42,32,67,97,110,39,116,32,111,112
 0657       DATA 101,110,58,32,7,85,115,101,58,32,99,111,117,110,116
 0688       DATA 32,91,45,108,119,99,93,32,91,102,105,108,101,93,32
 06B9       DATA 91,46,46,46,93,13,95,49,119
```

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FORMAT: Program submissions must be on tape or disk, and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs and debug our typing errors. All programs should be supported by some editorial commentary explaining how the program works. We also prefer that editorial copy be included in ASCII format on the tape or disk, using any of the word processors currently available for the Color Computer. Also, please include a double-spaced printout of your editorial material and program listing. Do not send text in all capital letters; use upper- and lowercase.

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For the benefit of those wanting more detailed information on making submissions, please send a self-addressed, stamped envelope (SASE) to: Submission Guidelines, THE RAINBOW, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. We will send you comprehensive guidelines.

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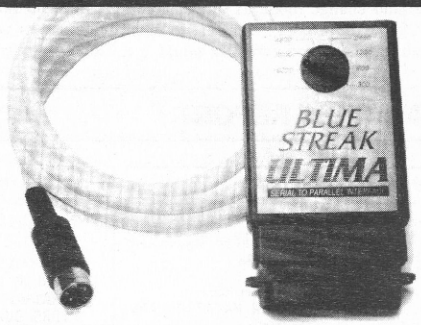

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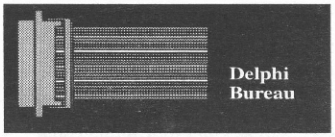


EDT Change Mode

I described how to use EDT in its command mode a few months ago. This month I'll describe how to use EDT in full-screen mode on Delphi. First let me remind you how to set up for full-screen editing. Type `/ECHO HOST` to set yourself up and `/ECHO ECHO` to restore the default echo setting. You can, of course, make a permanent change of your echo setting in the settings menu.

When you enter EDT and see the prompt, type `C` (short for change). You are now in full-screen edit mode. If your terminal program is set up for VT100 emulation and you have told Delphi in the settings menu that you are on a VT100, and if your terminal program can emulate the VT100 arrow keys, then the arrow keys will move you around the screen just as you suspect. There are also special functions available through the VT100 keypad. If your terminal program can emulate a VT100 keypad PF2 key, then pressing this key displays a help screen. Of course, this will also work if you have an actual VT100. VT52 emulation (or a VT52) also allows you to use the full-screen editing mode.

The keypad keys allow you to cut and paste blocks of text, lines, words and characters. PF1 is called the gold key — pressing it before certain keys changes the key's function. For example, PF4 cuts a line, and Gold PF4 pastes that line. To use Gold PF4, press PF1 then PF4. The help screen displays the function of each keypad key.

Once you finish editing, press CTRL-Z to get to the normal EDT prompt. Of course you can switch back and forth between line mode and change mode as often as you want. From the prompt, enter `EXIT` to leave the editor, just as you normally would.

Random Information

Over the past year, several people have sent various hints my way, hoping they would help other Delphi users. In no particular order, here are several hints.

Mike Dalene (MDALENE) pointed out that using the command `FILE FORUM.TXT NEW` in Forum puts all new messages into your workspace in the file `FORUM.TXT`. This command does not update your high-message pointer, so you need to use the `HIGH` command in Forum. You could alternatively just read the last message by entering `999999` (or some other absurdly large number), and then exit Forum. Either method sets your high-message pointer to the last message in Forum, preparing you to do this again the next time you log on. After the `FILE` command, you can go into your workspace and download the file using your favorite protocol. Don't forget to delete the file — conserve storage space!

Frank Hogg (FHOGG) suggested his own useful Forum command: `READ NEW NS FOLLOW LIMIT 12`. Let's look at this command one part at a time. `READ NEW` is simple to understand. The next part, `NS`, is short for nonstop and instructs Delphi to list all chosen messages without pausing at each page or between messages. This is useful when you can capture to memory or to disk, allowing you to capture all new messages and then read them offline. `FOLLOW` means you want to follow threads; thus, you won't see the messages in numerical order. Following threads can help you keep track of the discussions you are reading if you log in occasionally. Finally, `LIMIT 12` is useful if you don't generally like reading very long messages. You will see only the first 12 lines of messages longer than 12 lines. Delphi adds an extra line of ellipses (...) to messages longer than 12 lines to indicate that you saw part of the message.

Many months ago, I mentioned that any line in a forum message beginning with `.!` is a comment that wouldn't be seen by people reading the message. **Jason Bucata** (JBUCATA) reminded me that people who type `/ZDOTS` will see these lines! This command turns off the Delphi formatter and shows you all dot commands. Use `/NOZDOTS` to enable the formatter.

Jason also wrote that `/ENT *` shows you the names of the last 10 people to enter the SIG, as well as the time at which they entered.

Michael Wright (MIWRIGHT) sent me the following message in Mail:

About four to five weeks ago, we had some thunderstorms in this part of Texas and I never thought about disconnecting my modem from the phone lines (nor any of my telephones). I have since replaced my modem and three telephones. You may want to remind your readers of possible hazards to avoid the same.

April Uploads

Shortly after finishing the database reorganization, **Greg Law** (GREGL) uploaded *Alpha Directory* — a preliminary list of all files in the OS-9 SIG databases and their full description. Note that this upload is in the `.ZIP` format, so you need an unzipping program to dearchive it; it is also very large.

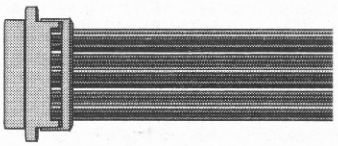
Shawn Driscoll (EARTHER) released `mdir` for OS-9/6809 that works similiarly to the OS-9/68000 command of the same name. **Darren Kindberg** (DKINDBERG) updated his calendar program for *MultiVue*. **Wes Gale** (WESGALE) wins this month's busy uploader award! Among other contributions are `Junk` — a safer delete utility that copies deleted files to a scratch area where you later delete them yourself (the files are not deleted). If you have deleted something accidentally, you can easily retrieve it. His `cdir` utility allows rapid searching for files using wildcard characters. `XArc` makes it easy for you to extract files from an archive of almost any type without having to remember the command-line options of each dearchiving program. Wes also uploaded a demo version of a fast bootfile editor for OS-9/6809. Finally, he uploaded a bundle of *RiBBS* utilities. **Jim Martin**'s (WOAY) latest `gsort` is compatible with `undel` and `RBF` Edition 30.

Rick Adams (RICKADAMS) released Version 4.2 of his UUCP package. This release adds new features and fixes some bugs. **Eddie Kuns** (EDDIEKUNS) contributed the latest updated clock modules for the OS-9 software clock and the Burke & Burke and Disto real-time clocks. These clock drivers are based on the work of **Bruce Isted** (BRUCEISTED) with additional help from **Tim Kientzle** (TIMKIENTZLE). If you are having trouble with dropped characters or terminal programs hanging, this clock driver may fix your problems. It correctly diddles the GIME to ensure that no interrupts are lost.

If you want to test your disk-drive speed on an OS-9/68000-based system, **Mark Griffith**'s (MARKGRIFFITH) `DDTest` should be helpful. It tests read and write speeds as well as track-to-track and average-seek rates. **John Wainwright** (JOHNREED) uploaded a port of the popular *TeX* typesetting language including a previewer that should work with K-Windows. **Mike Haaland** (MIKEHAALAND) released `AAPlay` — a K-Windows program that displays *AutoDesk Animator* `.FLI` and `.FLC` animations.

Don Vaillancourt (DONVAIL) uploaded the latest version of his OS-9/68000 graphics and sound standards proposal.

If you are feeling politically active but don't know how to get your message where it will do some good, you will be interested in **Don Hutchison**'s (DONHUTCHISON) upload. This file lists all Congressfolk and their fax numbers. Now all you need is access to a fax machine! Don also contributed a file full of lawyer jokes. **Brian Flahive** (BFLAHIVE) released *Easy Reader*, which allows you to easily read `.DOC` and `.TXT` files.



Eddie Kuns is pursuing a doctorate in physics at Rutgers University. He lives in Aurora, Illinois, and works as a programmer and researcher at Fermilab. Eddie is the OS9 Online database manager; his username is EDDIEKUNS.

DATABASE REPORT

OS-9 SIG

General Information
SCULPTOR AVAILABILITY ANN. FHOGG Frank Hogg
PNW_COCOFEST BACKFIRE Christopher Johnson
OS9 UNDERGROUND:NEW MAGAZINE ANN MOHRT Tim Mohr
SIGNETIC DATA AVAILABLE (FREE) LARRYOLSON Larry Olson
OS-9 FOR MAC:ANNOUNCEMENT/REVIEW FHOGG Frank Hogg

Applications (6809)
MDIR: OSK LIKE MODULE DIRECTORY EARTHER Shawn Driscoll
THEO: THESAURUS PROGRAM RAYMAYEUX Raymond Mayeux
PORDER: PURCHASE ORDER PROGRAM LUTE Lute Mullenix
GCAL 1.1: CALENDAR FOR MULTIVUE DKINDBERG Darren Kindberg
JUNK: DELETE UTILITY WESGALE Wes Gale
CDIR DIRECTORY/FILE CASE UTIL WESGALE Wes Gale
GSORT V9:NEW SORT FOR M-VUE WOAY Jim Martin
XARC ARCHIVE EXTRACTION UTILITY WESGALE Wes Gale
KWIKGEN - DEMO: BOOTFILE EDITOR WESGALE Wes Gale

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Standards
STANDARDS PROPOSAL FOR OSK DONVAIL Don Vaillancourt

CoCo SIG

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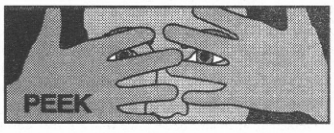
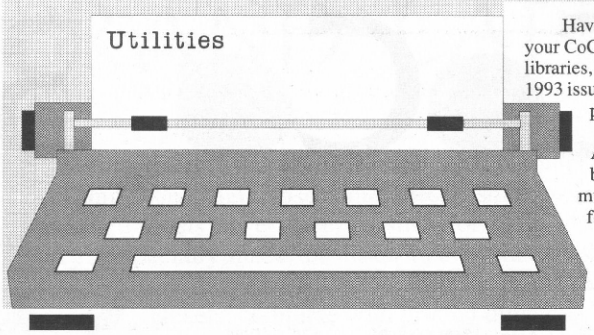
LAWYER JOKES DONHUTCHISON Don Hutchison

Utilities & Applications
EASY READER 1.0 BFLAHIVE Brian Flahive



It is often desirable to know how many characters a user has entered in a string after an `INPUT` or `LINEINPUT` statement is executed. One way of doing this is to use the `LEN` (length) function (e.g., `A=LEN(A$)`). Another way is to use a peek. Memory Location 425 contains the length of the most recently entered string; to get this information, use `A=PEEK(425)`. This latter approach may be just a bit faster than the first.

CALL FOR . . .



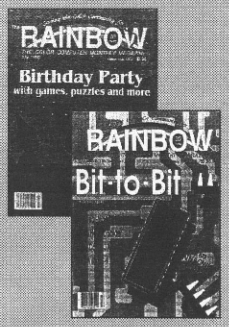
Have you written an interesting utility program for use with your CoCo? Perhaps others would find it a useful addition to their libraries, too! We are now making tentative plans for the January 1993 issue of THE RAINBOW and are accepting submissions appropriate for that issue's theme, Utilities.

We welcome submissions for BASIC as well as OS-9. All submissions intended for the January 1993 issue must be received by us no later than September 25, 1992, and must follow our standard submission guidelines (see Page 9 for details and address).

We'd also like to see any other programs you have written (submitted material must be the original work of the submitting party, or submitted with written permission). All submissions are evaluated and considered for publication in future issues.

Yes! They're still available!

RAINBOW Back Issues



BACK ISSUES STILL AVAILABLE
Have you explored the wealth of information in our past issues? From our very first, four-page issue to many with more than 300 pages of material, it's all just for CoCo users — a great way to expand your library!

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All back issues sell for the single issue cover price. In addition, there is a $3.50 charge for the first issue, plus 50 cents for each additional issue for postage and handling if sent by United Parcel Service. There is a $5 charge for the first issue, plus a $1 charge for each additional issue on orders sent by U.S.Mail. UPS will not deliver to a post office box or to another country.

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Available issues through June 1982 are provided on white paper in a reprint form. All others are in regular magazine form. VISA, MasterCard and American Express accepted. Kentucky residents please add 6 percent sales tax; Canadian residents, 7 percent GST. In order to hold down costs, we do not bill, and no C.O.D. orders are accepted.

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Updating Submission Information

THE RAINBOW has received literally thousands of programs and articles over the years. Obviously we can't publish all of them immediately, so we often hold them for possible publication in later issues. Unfortunately, some of the better submissions are being held because the authors have moved without notifying us of their new addresses.

If you have submitted a program in the past, then moved, please take a few minutes to send us a note with your new address and phone number. Or if you know of someone who fits this description and does not currently read THE RAINBOW, please have them contact us. Our address is THE RAINBOW, The Falsoft Building, 9509 U.S. Hwy 42, P.O. Box 385, Prospect, KY 40059. Send updates to the attention of the Editorial Department.

Received and Certified

The following products have recently been received by THE RAINBOW, examined by our staff and issued the Rainbow Seal of Certification, your assurance that we have seen the product and have ascertained that it is what it purports to be.

CF83-9: Graphic Set, a word set that allows PMODE graphics use through *CF83 Forth* (required, purchased separately). Supports all PMODE commands (though they are named differently) for creating, manipulating and viewing graphics on the CoCo 1, 2 or 3. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485, (708) 998-1656; $28 with printed manual, $15 with manual on disk; Canadian orders add $3, all other foreign orders add $10; all funds U.S.*

CoCo Cassette #117, a variety of programs for the CoCo 1, 2 and 3. This issue includes *Boxes*, an arcade-type game; *Tic Tac Toe 3*, for the Color Computer 3; *Menu*, a disk-based menuing system; *Muncher*, a simple text-based *PacMan* play-alike; *Riddle*; *LottoGME*, a personal lotto game; *HCopy*, a utility for saving graphics images to unused RAM for later use; *Rahul's Quest 3*, a joystick-based CoCo 3 adventure; *Cars Typing Tutor*, a typing tutor with a twist; and *Protect*, a Tom Mix game. *T & D Subscription Software, 2490 Miles Standish Drive, Holland, MI 49424, (616) 399-9468; $8.*

CoCo Font Pro, a utility for creating, editing, saving and displaying text (using HPRINT) in different fonts on the CoCo 3 Hi-Res graphics screens. Fonts included are normal, normal inverted, picture, script, fancy, outline and bold. Extra fonts are available. *Color Computing Software, 65 Oak Road, Canton, MA 02021; $14.95 plus $1 S/H.*

Life and Death, the game of *Life* for one or two players — play the game instead of simply watching it. Written in *CF83 Forth*. Requires at least 64K, one disk drive and a color monitor (RGB or color composite) or color television. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485, (708) 998-1656; $10 with printed manual; Canadian orders add $3, all other foreign orders add $10; all funds U.S.*

The Rainbow Seal of Certification is open to all manufacturers of products applicable to the Tandy Color Computer, regardless of whether or not those companies advertise in THE RAINBOW. By awarding the Seal, we certify the product exists — we have a sample copy and have examined it. However, this does not constitute any guarantee of satisfaction. As soon as possible, these products will be forwarded to reviewers for evaluation.

Feature Program

Up Top on the CoCo 3

George and Ellen Aftamonow, two self-taught programmers, believe computer users need another number cruncher as badly as a pig needs a wallet. So they like to sit down and enjoy the challenge of writing entertainment software. They can be contacted at 46 Howe Street, Milford, CT 06460, (203) 878-3602. Please include an SASE when requesting a reply.

In these days of Nintendo(tm) et al, strategy games are sometimes few and far between. *Uptop* is a challenging CoCo 3 game that requires logical skills and the ability to plan ahead — no thumb-breaking joystick action is necessary.

When run, *Uptop* displays a vertical 4-by-11 grid, the bottom four rows of which are filled with playing pieces of different colors. The object is to move all 16 pieces as close to the top of the grid as possible. The closer you get, the more points you score. Ordinarily this goal would not be too difficult to achieve. However, let's take a look at *Uptop*'s operation and rules.

To move, position the flashing cursor over the desired piece using the joysticks and press ENTER. The selected piece moves upward the same number of rows as there are pieces in the original row (no piece can move horizontally or diagonally). For example, if you choose a piece in a row with three pieces, the selected piece moves up three rows. The three rules governing your moves are as follows:

☞ the square into which you intend to move the selected piece must be vacant,

☞ a piece may not be moved into a row that already contains a piece of the same color,

☞ and the top-most piece on the grid at any time may *not* be moved one square upward.

Given these rules, we expect you'll find *Uptop* to be quite a challenge. Points are scored only when the upper blocks are occupied; 560 points is a perfect score. The game automatically ends when you cannot make a legal move or when all the pieces are in the top four rows. Press Q at any time to quit or start a new game. Good Luck!

CoCo 3

The Listing: UPTOP

```
1 'UPTOP
2 'BY GEORGE & ELLEN AFTAMONOW
3 'COPYRIGHT (C) 1992
4 'FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 PALETTE0,0:PALETTE5,63:HSCREEN2:HCLS0:HCOLOR5,0
15 HPRINT(10,10),"<C>MP OR <R>GB?"
20 I$=INKEY$:IFI$=""THEN20
30 IFI$="C"THEN40ELSEIFI$="R"THEN50ELSE20
40 PALETTECMP:PALETTE0,0:PALETTE1,17:PALETTE2,8:PALETTE3,60:PALETTE4,53:PALETTE5,63:GOTO60
50 PALETTERGB:PALETTE0,0:PALETTE1,16:PALETTE2,39:PALETTE3,27:PALETTE4,50:PALETTE5,63:'0=BLACK:1=GREEN:2=RED:3=BLUE:4=YELLOW:5=WHITE
60 HCLS0
65 HDRAW"C5S8BM90,40R3D10R5BU10R3D13NL11BR5 R3U6R6EU5HL9BF3NUD2R4BE5BR9 R11D2L5D11NL2BR9 NR8BE3NR3HU6BU3NL2R6FD11GBR6 R3U6R6EU5HL9BF3NUD2R4S4"
70 HPRINT(19,12),"by":HPRINT(9,16),"GEORGE & ELLEN AFTAMONOW"
75 FORVO=30TO1STEP-4:PLAY"V=VO;":FORZO=5TO1STEP-3:FORZN=9TO1STEP-1:PLAY"L255O=ZO;=ZN;":NEXTZN,ZO,VO:PLAY"V15"
80 HCLS5:HCOLOR1:HPRINT(7,4),"DO YOU NEED INSTRUCTIONS?":HLINE(40,20)-(280,60),PSET,B:HLINE(40,61)-(280,61),PSET
82 I$=INKEY$:IFI$=""THEN82ELSEIFI$="N"THEN90
84 IFI$="Y"THENGOSUB700ELSE82
90 DATA1,2,3,4,2,3,4,1,3,4,1,2,4,1,2,3
95 DIMA(4,11)
100 HCLS5:HCOLOR0,5
110 FORZ=15TO180STEP15:HLINE(130,Z)-(190,Z),PSET:NEXT:FORZ=130TO190STEP15:HLINE(Z,15)-(Z,180),PSET:NEXT
115 FORZ=16TO181STEP15:HLINE(131,Z)-(191,Z),PSET:NEXT:FORZ=131TO191STEP15:HLINE(Z,16)-(Z,181),PSET:NEXT
120 X=0:Y1=8:FORY=0TO45STEP15:FORQ=1TO4:READZ:HCIRCLE(X+138,Y+128),5,Z:HPAINT(X+138,Y+128),Z,Z:X=X+15:A(Q,Y1)=Z:NEXTQ:X=0:Y1=Y1+1:NEXTY
130 HCOLOR1:A=50:FORE=2TO10STEP2:HPRINT(13,E),A:A=A-10:NEXT:HPRINT(29,4),"SCORE"
140 HCOLOR0:HLINE(8,2)-(318,190),PSET,B:HLINE(60,6)-(314,186),PSET,B:HLINE(12,6)-(56,186),PSET,B:HPAINT(10,4),4,0
150 HDRAW"BM50,60L12D24L8U24L12E16F16":HPAINT(40,58),2,0
152 HPRINT(3,2),"UP":HPRINT(3,4),"TOP":HPRINT(2,22),"GA/EA"
199 X=130:Y=165:C=1:R=11
200 HCOLOR0:I$=INKEY$:IFI$=""THENHLINE(X,Y)-(X+15,Y+15),PRESET,B:HLINE(X,Y)-(X+15,Y+15),PSET,B:GOTO200
210 IFI$=CHR$(13)ANDA(C,R)=0THEN200ELSEIFI$=CHR$(13)THEN300
220 IFI$=CHR$(9)ANDX<175THENX=X+15:C=C+1:GOTO200
230 IFI$=CHR$(8)ANDX>130THENX=X-15:C=C-1:GOTO200
240 IFI$=CHR$(94)ANDY>15THENY=Y-15:R=R-1:GOTO200
250 IFI$=CHR$(10)ANDY<165THENY=Y+15:R=R+1:GOTO200
255 IFI$="Q"THEN520
260 GOTO200
300 M=0:FORZ=1TO4:IFA(Z,R)>0 THENM=M+1:NEXTELSENEXT
310 NR=R-M:IFNR<1THEN400ELSEIFA(C,NR)>0THEN400
320 FORZ=1TO4:IFZ=C THENNEXTELSEIFA(C,R)=A(Z,NR)THEN400ELSENEXT
325 IFM>1THEN330ELSEFORZ=R-1 TO1STEP-1:IFA(C,Z)>0THEN330ELSENEXT
327 GOTO400
330 A(C,NR)=A(C,R):P=A(C,R):A(C,R)=0:X2=138+(C-1)*15:Y2=23+(NR-1)*15:HPAINT(X+8,Y+8),5,5:HCIRCLE(X2,Y2),5,P:HPAINT(X2,Y2),P,P
340 IFR<6THENSC=SC-(6-R)*10
350 IFNR<6THENSC=SC+(6-NR)*10
360 HCOLOR5:HLINE(230,48)-(262,60),PSET,BF:HCOLOR1:HPRINT(29,6),SC:HCOLOR0:IFSC=560THEN500ELSEGOSUB550:GOTO200
370  'IFSC=560THEN500
400 PLAY"T250O4ABCO2DDD":HCOLOR1:HPRINT(28,16),"ILLEGAL":HPRINT(30,18),"MOVE":FORQ=1TO700:NEXT:HCOLOR5:HPRINT(28,16),"ILLEGAL":HPRINT(30,18),"MOVE":GOTO200
500 FORQ=10TO60STEP5:PALETTE5,Q:FORZZ=1TO22:NEXTZZ,Q:PALETTE5,63
510 HCOLOR1:HPRINT(28,10),"PERFECT":HPRINT(29,12),"SCORE"
520 HCOLOR1:HPRINT(26,18),"PLAY AGAIN?":HPRINT(29,20),"(Y/N)"
530 I$=INKEY$:IFI$=""THEN530
540 IFI$="Y"THENRESTORE:SC=0:FORZZ=1TO11:FORQQ=1TO4:A(QQ,ZZ)=0:NEXTQQ,ZZ:GOTO100ELSEIFI$="N"THEN820ELSE530
549 'check moves left
550 FORD=3TO11:FORA=1TO4:IFA(A,D)=0THENNEXTA:NEXTD
555 M=0:IFD=12THEN640ELSEFORQ=1TO4:IFA(Q,D)=0 THENNEXTELSEM=M+1:NEXT
560 IFD=12THEN640
565 IFA=5THENNEXTD
570 CR=D-M:IFCR<1THENNEXTA ELSEIFA(A,CR)>0 THENNEXTA
580 IFA=5THENNEXTD
585 IFD=12THEN640
590 FORG=1TO4:IFA(G,CR)=A(A,D)THENNEXTA ELSENEXTG
595 IFD=12THEN640
600 IFA=5THENNEXTD
604 IFM>1THENRETURN
605 IFM=1THENFORE=D-1 TO1STEP-1:IFA(A,E)>0THENRETURNELSENEXTE
610 IFA=4THENNEXTD ELSENEXTA
620 IFD=12THEN640
630 RETURN
640 HCOLOR1:HPRINT(25,13),"NO MOVES LEFT":PLAY"T250O2BBBO1AAAO2DDD":GOTO520
700 HCLS5:HPRINT(1,1),"The  object  is to move all of  your":HPRINT(1,2),"pieces to the top of the grid. Place":HPRINT(1,3),"the  blinking rectangle over the piece":HPRINT(1,4),"you wish to move, using the arrow keys,":HPRINT(1,5),"and press ENTER. The p
710 HPRINT(1,5),"and press ENTER. The piece is moved":HPRINT(1,6),"upward the same number of spaces as":HPRINT(1,7),"there are pieces in that row.":HPRINT(1,8),"For example: If there are 2 pieces in":HPRINT(1,9),"that row, the piece moves upward 2"
720 HPRINT(1,10),"spaces.":HPRINT(1,12),"ILLEGAL MOVES:":HPRINT(2,13),"1) The new space must be vacant.":HPRINT(2,14),"2) A piece may not land in a row if":HPRINT(1,15),"there is already a piece of the same":HPRINT(1,16),"color in that row."
730 HPRINT(2,17),"3) The topmost  piece may NOT move one":HPRINT(1,18),"space upward."
740 HPRINT(8,24),"Press ENTER to continue"
750 IFINKEY$=""THEN750
760 HCLS5:HPRINT(12,1),"SCORING:":HPRINT(1,3),"Points are scored  only when the":HPRINT(1,4),"squares up top are occupied."
770 HPRINT(1,5),"560 is perfect.":HPRINT(1,7),"The game ends when you cannot move or":HPRINT(1,8),"when all pieces are up top. Press <Q>":HPRINT(1,9),"at any time to quit and start over."
780 HPRINT(8,24),"Press ENTER to begin."
800 I$=INKEY$:IFI$=""THEN800
810 RETURN
820 HCLS:Z=21:HCOLOR3:HPRINT(16,1),"THE END":HPRINT(16,22),"THE END":W$="T":X=16:GOSUB900:W$="H":X=17:GOSUB900:W$="E":X=18:GOSUB900:X=20:GOSUB900:W$="N":X=21:GOSUB900:W$="D":X=22:GOSUB900
830 HCOLOR2:HLINE(90,80)-(220,116),PSET,B:HLINE(80,72)-(230,124),PSET,B:HPAINT(82,78),0,2
850 CLS:END
900 Z=23:FORY=1TO11:Z=Z-1:PLAY"T250O1D":HCOLOR3:HPRINT(X,Y),W$:HPRINT(X,Z),W$:PLAY"O2A":HCOLOR5:HPRINT(X,Y),W$:HPRINT(X,Z),W$:NEXT:HCOLOR3:HPRINT(X,Y),W$:RETURN
```

Feature Program

BRAND-LABEL DISK JACKETS

Labeling disks is one of those important computer housekeeping chores that is also sometimes frustrating. The little gummed labels never seem to stick for long — even if they're specially made for disks. I cured this sticky little problem by writing a BASIC program to create my own disk jackets, complete with printed directory.

DJACKET is a short CoCo 3 program that prints a disk-jacket outline using standard ASCII characters. Make sure your printer is online, and run the program. When prompted, put the disk for which you want to create a jacket into Drive 0. The program reads the disk's directory information as it prints. When it is finished, you can print another jacket or quit.

After you remove the printed paper from the printer, use scissors to cut around the extreme outer portion of the outline. Then fold the form on the three lines indicated in Figure 1. Use a little transparent tape (or glue, if you want) to attach the flaps to the back side of the jacket, and you're ready to go.

The control codes DJACKET uses to achieve a cleaner appearance are in lines 520 through 540 and lines 570 through 590. While the program is designed for the Tandy DMP-107 printer, these program lines are commented, and it should be easy to alter the codes to suit your printer.

———---

Ron Dahlke is a certified auto technician who has worked in the auto-repair business since 1985. He purchased his Color Computer in 1986 to keep shop records and has been programming since that time. He can be contacted at W7585 Novak Lane, Waterloo, WI 53594, (414) 261-6989. Please include an SASE when requesting a reply.

CoCo 3 Disk

The Listing: DJACKET

```
1 'DISK-JACKET PRINTER
2 'BY RON DAHLKE
3 'COPYRIGHT (C) 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 CLEAR 5000
20 DIM F0$(75),D0$(11)
30 POKE 150,18    ' 1200 BAUD
40 WIDTH32:PALETTE 12,63:PALETTE
 13,0:CLS:PRINT
50 PRINT"      PUT DISK IN DRIVE
 0 "
60 PRINT"LINE UP PAPER AND PRESS
 ANY KEY"
70 EXEC 44539:PRINT#-2:GOSUB 560
80 CLS:PRINT"          WORKING"
90 GOSUB 450:FOR X=1 TO 3:GOSUB
460:GOSUB 470:NEXT X
100 GOSUB 460
110 GOSUB 510:PRINT#-2,TAB(28);"
Free Space :";FREE(0);:GOSUB 560
120 GOSUB 470
130 GOSUB 460:GOSUB 470
140 GOSUB 350:GOSUB 220
150 PRINT#-2,"+      ";CHR$(124);
STRING$(56,32);CHR$(124);"     +
"
160 PRINT#-2,"  +    ";CHR$(124);
STRING$(56,32);CHR$(124);"    +
"
170 PRINT#-2,"     + ";CHR$(124);
STRING$(56,32);CHR$(124);" +
"
180 GOSUB 500
190 FOR X=1 TO 27:GOSUB 490:NEXT
 X
200 GOSUB 500
210 GOTO 40
220 N=0:R=1
230 FOR L=1 TO 15
240 GOSUB 460
250 IF R>68 THEN 340
260 IF LEFT$(F0$(R),1)=CHR$(255)
 THEN R=R+1:GOTO 250
270 IF LEFT$(F0$(R),1)=CHR$(0) T
HEN R=R+1:GOTO 250
280 IF N=0 THEN PRINT#-2,TAB(13)
;
290 IF N=1 THEN PRINT#-2,TAB(29)
;
300 IF N=2 THEN PRINT#-2,TAB(45)
;
310 GOSUB 510:PRINT#-2,F0$(R);:G
OSUB 560
320 R=R+1:N=N+1
330 IF N<3 THEN 250 ELSE N=0:GOT
O 340
340 GOSUB 470:NEXT L:RETURN
350 Y=1:FOR X=3 TO 11
360 DSKI$0,17,X,A$,B$
370 D0$(X)=A$+LEFT$(B$,127)
380 F0$(Y)=LEFT$(D0$(X),8)+"."+M
ID$(D0$(X),9,3)
390 Y=Y+1
400 FOR N=1 TO 7
410 F0$(Y)=MID$(D0$(X),N*32+1,8)
+"."+MID$(D0$(X),9+N*32,3)
420 Y=Y+1
430 NEXT N,X
440 RETURN
450 PRINT#-2,STRING$(70,95):RETU
RN
460 PRINT#-2,CHR$(124);STRING$(5
,32);CHR$(124);:RETURN
470 PRINT#-2,TAB(63);CHR$(124);S
TRING$(5,32);CHR$(124):RETURN
480 PRINT#-2,TAB(7);CHR$(124);ST
RING$(56,32);CHR$(124):RETURN
490 PRINT#-2,STRING$(6,32);CHR$(
124);STRING$(56,32);CHR$(124);RE
TURN
500 PRINT#-2,STRING$(6,32);CHR$(
124);STRING$(56,95);CHR$(124);RE
TURN
510 A=PEEK(&H9C)
520 PRINT#-2,CHR$(27);CHR$(18);
          ' NLQ 10 CPI
530 PRINT#-2,CHR$(27);CHR$(66);C
HR$(1);   ' START ITALICS
540 PRINT#-2,CHR$(27);CHR$(31);
          ' START BOLD
550 POKE &H9C,A:RETURN
560 A=PEEK(&H9C)
570 PRINT#-2,CHR$(27);CHR$(19);
          ' STANDARD 10 CPI
580 PRINT#-2,CHR$(27);CHR$(66);C
HR$(0);   ' END ITALICS
590 PRINT#-2,CHR$(27);CHR$(32);
          ' END BOLD
600 POKE&H9C,A:RETURN
```

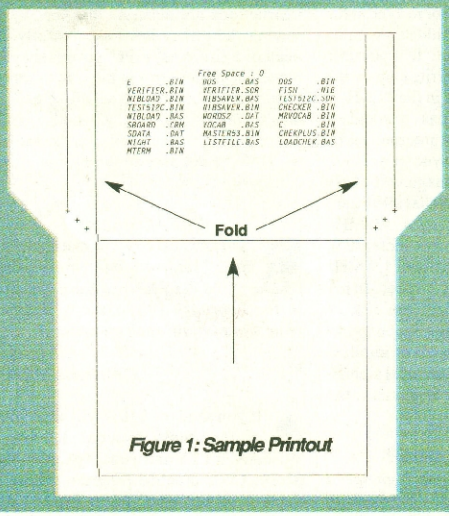


Figure 1: Sample Printout

Feature Program

Driller of the Times

Math Driller is designed as a teaching aid for the standard multiplication tables. The program works with any CoCo having at least 16K and Extended BASIC.

Math Driller works much like flash cards — multiplication problems are displayed in rapid succession onscreen, and the student must enter the correct answers. If the student takes too much time entering an answer or doesn't enter the correct answer, he is informed (with a little sound help from the PLAY command) that he needs to practice more. If you (or your child) is having problems with times tables, give *Math Driller* a whirl.

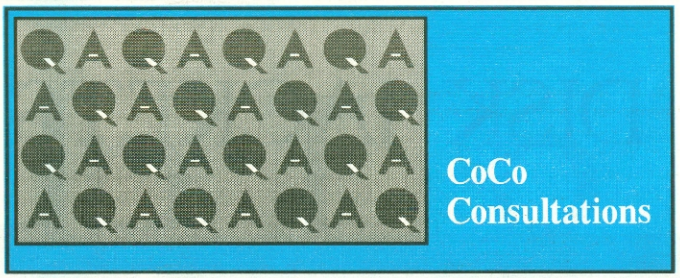
———

Trevor Boehm is a tenth-grade student whose greatest passion is challenging computers with new programs. He has participated in several science fairs and has received numerous awards for his work. He can be contacted at 77 Inwood Cres., Winnipeg, MB R2Y 1A2, Canada. Please include an SASE when requesting a reply.

16K Extended

The Listing: DRILLER

```
1 'MATH DRILLER
2 'BY TREVOR BOEHM
3 'COPYRIGHT (C) 1992
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 CLS:PRINT:PRINTTAB(9)"MATH DR
ILLER"
20 PRINTTAB(9)"=============="
30 X=RND(-TIMER):X=RND(12):Y=RND
(12)
40 TIMER=0:PRINT:PRINTTAB(4)X:PR
INTTAB(2)"X ";Y:PRINTTAB(2)"---
-"
45 Q=Q+1
50 PRINTTAB(2):INPUT N
60 IFN=X*Y THENPRINT@ 174,"CORRE
CT"::C=C+1ELSEPRINT@ 174,"WRONG-
LEARN IT"::SOUND25,4:W=W+1
65 PRINT@ 330, C;"CORRECT"
70 IFTIMER>200 THENPRINT@ 388,"I
T TOOK YOU LONG ENOUGH !":PRINT"
 LOOKS LIKE YOU HAVE TO LEARN":P
RINTTAB(7)"YOUR TIMES TABLES":FO
RI=100TO200STEP10:SOUNDI,5:NEXT:
IF N=X*Y THEN C=C-.5
80 SOUND 100,7:IF Q=100 THEN 90
ELSEGOTO0
90 CLS:PRINT" YOU GOT"; C/100;"
PERCENT !!!":PRINT"COWABUNGA, MA
THEMATICAL DUDES !":EXEC44539:RU
N
```



High-Speed Crystals?

I've heard various reports on Internet of folks accelerating the speed of their CoCo 3 by dropping in a higher speed crystal. Specifically, one person reported some degree of success replacing the 28.63636 MHz (8x Colorburst frequency) crystal used in the CoCo 3 with a 32 MHz crystal. What are your thoughts about this?

Art Flexser (ARTFLEXSER)
Miami, Florida

A I will stick to the position I took in an earlier "CoCo Consultations" column: Increasing the speed of the clock crystal is a foolish pursuit, of interest only to the most fanatic of hackers. Yes, Dave Macias reports successfully getting a CoCo to work with a 32 MHz crystal. But he also acknowledges that at that speed he no longer can get the video image to sync with his Magnavox 1CM135. He was able to persuade a monochrome monitor to sync at the increased sync speed by twiddling with its horizontal sync adjustment. It's possible that if he messes with the ferrite slug on the horizontal sync adjustment in the 1CM135 (assuming the 1CM135 has a standard horizontal sync adjustment internally), he might yet get his CoCo to sync to it. However, even if he does, the image will likely be somewhat distorted. Note that all you are getting when you change to a 32 MHz crystal is a roughly 10 percent increase in actual computer speed, from about 1.9 MHz to about 2.3 MHz actual cycle speed. In my opinion this is hardly worth the risk of unreliable operation and the video problems it causes. Dave's report is of intellectual interest but not of any practical significance for those who want to increase the speed of their CoCo 3.

High-Speed 6809s?

I've heard that there exist high-speed versions of the 68B09E chip rated up to 8 MHz operation. Is there any way I can use such versions in a speeded-up CoCo 3? How else can I increase the speed of my CoCo 3? What's involved in putting a CoCo 3 inside a tower case?

Wayne Thompson (WTHOMPSON)
Sachse, Texas

A As I noted above, it is not feasible to increase the clock speed of the CoCo 3 more than a tiny bit without running into serious problems involving the memory access and video display. For this reason, 6809 and 6309 chips rated to run at more than 2 MHz cannot be used at speeds greater than 2 MHz inside the CoCo 3. However, if you are using OS-9, there is one way to increase performance: Consider installing Burke & Burke's PowerBoost kit. This $29.95 kit consists of a Hitachi 63B09E chip and patches to the OS-9 software to take advantage of the expanded and more efficient instruction set of the 63B09E. Chris Burke claims that block moves can be speeded up 400 percent using the 63B09E at the standard 1.89 MHz clock rate with the 63B09E in native 6309 mode. Since any increase in performance will vary with the program being run, I'm not sure you can expect more than about a 50 percent overall increase in speed running ordinary applications. But this is the only sensible route to boosting your CoCo 3's speed without compromising the reliability or video display. You do have to have the skill to desolder the existing 68B09E inside your CoCo 3 and replace it with a socket. Burke & Burke supplies the 63B09E, along with the patches to OS-9 and a book about the 6309 processor.

As for putting a Color Computer in a PC-clone case . . . that's the sort of thing that "if you have to ask how to do it, you'd best not try it." I suggest you consider doing it only with direct, one-on-one help from someone locally who has already done this. In a past "CoCo Consultations," I have given explicit instructions on how to hook a CoCo 3 to a PC-compatible power supply. Readers have reported to me that, by and large, these instructions are accurate and that by following them they have successfully connected a CoCo to a PC power supply. I made one minor error in those instructions: I stated that hooking up the 78L08 to power was required only for CoCo audio. This is not correct. You need power at the 78L08 in the CoCo 3 not only for audio but also for composite video.

WEFAX Updates

In the August 1990 "CoCo Consultations" you mentioned there was an update to the WEFAX *program appearing in the February 1985 issue of Rainbow. How can I obtain such an update?*

Ellis Cornell
Dearborn, Michigan

A If you send me $10, I will send you all of the latest material I have for WEFAX, RTTY and a quality CoCo-based Morse Code practice program. These updates have not changed in the last three years, I should note. They do include printer drivers for most older Tandy printers including most of the DMP-130 series, for older Okidata printers, and for older Gemini printers. Also included is a send and receive version of WEFAX that has been used to transmit weather maps to ships at sea. The package includes an updated version of RTTY for the CoCo that supports several different baud rates and allows transmission of previously prepared and saved ASCII files, and saving of incoming text to disk as an ASCII file. You can contact me at 1633 Bayo Vista Ave, San Pablo, CA 94806.

Spare Motherboards

How can I get a spare working motherboard for a gray-case CoCo 1, Tandy Cat. No. 26-3003A?

John L. Van Winkle
Wickenburg, Arizona

A Tandy no longer stocks CoCo 1 or 2 motherboards. Even when they did, such things were not at all economical to purchase from Tandy. In big cities, at occasional garage sales and at electronic and ham flea markets, CoCo 1's and 2's sell for from $10 to $25 each. That is the best way to fix a broken CoCo 1 or 2.

Graphics Conversions

Those interested in converting `.GIF` *files to* `.MGE`*-type files should be aware that in the CoCo SIG on Delphi is a program called* `NEWGIF.BIN` *that allows you to do this. This program has been in the CoCo SIG for a while. Using another converter called* `MGETOCM3.BIN` *(also available in the CoCo SIG), you can convert* `.MGE` *files to* `.CM3` *format.*

John Burke (JBURKE)
Freemont, California

Downloading With *Autoterm 6.3*

I'm having problems downloading tokenized BASIC *programs and binary programs using* Autoterm 6.3. *After I save the program and then try to load it, I get an IE Error. The manual is very confusing and ambiguous on this subject.*

Charles Wiggins (WIGGINSC)
Tucson, Arizona

A Charles, the problem you are having is due to a bug in *Autoterm 6.3*. The file's length is stored as one byte less than it should be, hence the IE Error when you try to load it. There is a file in the Telecommunications database of the CoCo SIG on Delphi that outlines a procedure for repairing such a file. Search the database with the keyword `AUTOTERM`. You will find a file written by Tim Kientzle, based on information supplied by Richard Gonzales (DRIFTY). The fix described is as follows: Use the editor in *Autoterm*. If you have a version of *Autoterm* prior to 6.3, use `A64` or `A32` (not `A128` or `A512` for they have another obscure bug).

1) Go into *Autoterm*'s text-editing mode, and delete any data in the buffer.
2) Load (SHIFT-CLEAR-L) the faulty file (the one with the IE Error on loading) into the editor.
3) Jump past the end of the file (SHIFT-Down Arrow).
4) Press ENTER (or any key).
5) Save (SHIFT-CLEAR-S) the resulting file to disk with a new filename (otherwise *Autoterm* will append the new file to the old one).
6) After you have determined that your fixed file works, delete the faulty file from your disk to prevent any confusion!

This will add an extra byte to the faulty file, fixing it. This procedure may sound complicated, but it actually takes only a few seconds to do. Thanks to Art Flexser for offering this explanation.

Re-inking Ribbons

What is meant by the description in Tandy's computer catalog of my ancient LP VII ribbon as being a "re-inking ribbon."

Tom Fann (TOMFANN)
Akron, Ohio

A Like many other ribbons, the LP VII ribbon has little rollers soaked with ink that rub against the ribbon as it moves in what likely is a continuous and possibly moebius loop, adding extra ink to it as it passes by. But be careful! As a ribbon gets used, it gets physically worn and ultimately physically tears, often catching a pin from the print head and destroying the print head. This is an especially nasty problem with 24-pin printers whose print heads have especially tiny, delicate print pins.

A Full Meg of Memory

What can you tell me about 1-megabyte upgrades for the CoCo 3? You mentioned you were using one in a previous "CoCo Consultations" column.

John H. Opheim
Burt, Iowa

A Disto/CRC produced a 1MB upgrade for the CoCo 3. It was a bit tricky to install, requiring soldering a 40-pin header to the 68B09E chip in the CoCo. This upgrade was of use principly with OS-9 (after a minor patch was made) and of little use to Disk BASIC users. Sadly, CRC no longer produces it, so it is generally not available. Occasionally CoCo PRO! has used ones for sale, and occasionally one gets offered for sale in the Classified Ads section of Delphi.

Simply Better in Parallel

I recently purchased Simply Better *for word processing. It works fine except it will not print through my Disto parallel printer port. Even* ADOS 3 *configured for sending output through the parallel printer port does not cure the problem. Is there a way to fix this?*

Randy E Longshore (RANDYE)
Alta Loma, California

A Art Flexser tells me that he knows of no patch for *Simply Better* to allow it to use the Disto Parallel port. Apparently *Simply Better* does not go through the BASIC ROM call for printer output, and thus *ADOS 3* cannot redirect its printer output. However, Art suggests a possible solution: Use the feature of *Simply Better* that allows you to save the printer output to disk. Then write a two or three line BASIC program that you can run under *ADOS 3* that prints the file. Just open the file, read a line at a time, and send that line to the printer, then loop back to input another line. Another option for *ADOS 3* users is the `SCANP` command, which will cause the file to be printed.

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of THE RAINBOW*'s CoCo SIG. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.*

If you've ever printed a long document using continuous fan-fold paper, you know how frustrating it can be to remove all the "edgies" or "holes" from the paper. Some people do this by separating all the pages, then painstakingly removing the edgies from each of them.

A better way of removing the edgies is to leave the pages connected and stacked. As long as there are no more than a few pages (seven or so) in a group, removing the edgies takes less time. As an added benefit the stability gained by working with several pages at once helps you remove the edgies more neatly and accurately.

6309 From Cover

NMOS (Negative Metal Oxide Silicon) technology. Chips constructed using NMOS technology are known for being relatively power hungry, and the 68B09E in the CoCo consumes nearly a tenth of an Ampere, or 100 milliamps.

Since the 6809 was originally introduced and gained in popularity, programmers and system designers wanted a CMOS (Complimentary Metal Oxide Silicon) version of the microprocessor. CMOS technology provides for a tenth the power consumption of an NMOS chip while actively executing code, and a hundredth (or less) the power consumption if put into a "standby" mode. CMOS technology allows for the design of battery-operated systems that, in this case, would ordinarily use a 6809.

Of course CMOS technology is trickier to engineer than NMOS, and Motorola initially could not produce such a version of the 6809. When the technology came to a point where making such a version became feasible, it turned out Hitachi had most experience with such matters. Motorola had previously contracted Hitachi for the production of CMOS versions of some of its other processors, so it was not surprising the company went to Hitachi for a CMOS version of the 6809, which Hitachi called the 6309.

Current evidence leads me to speculate that the engineers at Hitachi approached the problem of making the 6309 in a very different fashion from the original designers of the Motorola NMOS 6809. The original 6809 was laid out using *random logic* (which is sometimes referred to as "hard wired".) In this approach, all machine-language instructions are created by directly using physical arrays of logic elements. The Motorola 6809 is one of the last microprocessors designed in such a fashion.

In 1977 when the 6809 was being designed, more and more developers of CPUs were using what is called *microcode* for chip design. In this approach, a few very simple instructions are actually hard wired inside the processor, and code is placed in permanent ROM within the CPU. This code executes parts of the simple instruction set in order to seem to be executing the actual complex instruction set of the CPU chip.

The microcode approach makes it much easier to design, debug and modify a central processor chip. In 1977, however, it also had one significant disadvantage: Because the actual instructions had to be created by executing several instructions in a more primitive instruction set, a microcoded CPU would take more machine cycles to execute a particular instruction than would one designed using random (hard-wired) logic. Indeed, it is for this reason that the hard-wired 6809 could make much more efficient use of machine cycles than its microcoded competition of the time — that a 2-MHz 68B09E could get things done as fast as other chips of its generation operating at up to eight times the cycle speed.

Nearly ten years passed between the time the Motorola NMOS 6809 was created and the development of the Hitachi CMOS version of the chip. (That's an eon in terms of computer-chip development history.) In that time, engineers and chip designers learned a great deal about how to efficiently implement microcode type chip architecture, and they can now make a 6809-like chip that executes machine-language instructions as efficiently (and more so) as the original 6809, yet do it using microcode rather than the hard-wired approach.

It seems almost certain that the 6309 from Hitachi was designed using the microcode approach. I suspect after the engineers at Hitachi finished the microcode to allow the 6309 to perfectly emulate the Motorola 6809, they found there was a lot of space left in the internal ROM. They apparently used this space wisely and added a number of extra registers (see Figure 1) and a great number of extra instructions. Support was included for moving data to and from memory four times faster than the 6809 could, a 16-bit-by-16-bit multiply to a 32-bit product, error trapping, and more.

Even though Hitachi engineers knew how to make 6809 machine-language instructions execute using fewer machine cycles than with the 6809, Motorola had asked Hitachi to make the 6309 an exact pin-for-pin, instruction-for-instruction copy of the 6809. So Hitachi had to make all 6809 instructions execute in the exact same number of machine cycles as they did on the original 6809. This is important; some 6809 programs, like WEFAX and RTTY, depend on precise timing, which in turn is governed by instructions executing in certain known numbers of clock cycles. Had Hitachi improved the number of cycles for execution of standard 6809 instructions, such programs would cease to operate.

To counter this requirement, Hitachi also built into the 6309 a *native* or 6309 mode in which even the 6809 instructions had been recoded to execute in fewer clock cycles. Chris Burke's current testing of the 6309 indicates that, on the average, a 6309 executing 6809 instructions in the native (6309) mode executes those instructions about 15 percent faster. When in the native mode, even when running at the same clock speed and executing code that contains only valid 6809 instructions, a 6309 executes that code faster than a 6809.

When power is first applied to the 6309, it wakes up in the emulation (6809) mode in which all 6809-type instructions are executed in the same number of cycles as would be with a true 6809. (Still, this mode supports the powerful extra instructions for the extra registers, fast movement of data, and so on. The extra instructions should be present in all 6309 chips, even when they are "pretending" to be 6809s.) If the 6309 receives the proper code, however, it goes into the native mode. It is important to understand these two different ways a 6309 can be used to run code faster than a 6809 if you want to fully understand what Burke & Burke has accomplished with PowerBoost.

Is the 6309 Legitimate?

Since Motorola had asked Hitachi to make an exact CMOS version of the 6809, we can assume they did not want an enhanced 6809. They simply wanted an exact copy that uses low-power CMOS technology. Although an immense number of enhancements were built into the 6309, they could not be documented or announced because this would violate Hitachi's agreement with Motorola. When the 6309 was released, no one in the U.S. knew of the enhancements Hitachi's engineers had "secretly" added. Hackers became suspicious when they found that certain improperly written programs crashed *differently* on a 6309 than they would on a 6809. While information was eventually leaked in Japan regarding the extra registers and instructions in the 6309, only recently was this information translated and made available to 6809 programmers in the U.S. Indeed, although a handful of insiders may have had information about the 6309 for a year or more, the vast majority of 6809/CoCo/OS-9 programers in the U.S. learned details of

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the extra properties of the 6309 around April or May of 1992, when a document from Japan was circulated on Internet and Delphi.

One question knowledgeable hardware tinkerers will ask is, "Can we count on Hitachi keeping these extra features in future production runs of the 6309, given that these extra features are not officially documented?" Chris Burke addressed this issue in his seminar on the 6309 and PowerBoost at the Chicago 1992 CoCofest. Chris noted that in order to pull the new features from the 6309, Hitachi would have to recreate the mask of the chip, costing them a good deal of money. Thus, although there is no guarantee future production runs of the Hitachi 6309 will continue to have the features mentioned here (on which PowerBoost depends), it would seem likely that this will be the case. Chris pointed out that the 63B09E is relatively inexpensive, so interested parties might consider buying more than one 6309 to assure continued access to its features.

It's also possible that Motorola would get sufficiently upset over what Hitachi did to improve the 6309 that it would institute legal action to prevent the sale of the chip. However, with the 6809 being such a tiny fraction of Motorola's business, this seems highly unlikely at this time.

One more thing to remember: Since the extra features of the 6309 are not officially documented, I would imagine they are also not tested in quality control at Hitachi. Thus, it's possible that some production runs of the 6309 will work fine as 6809's but exhibit problems when used in the native mode or to execute the extra instructions. This too is a theoretical possibility that I think is not all that likely to be a problem in practice.

The Future?

We've already taken a brief look at the 6309's performance advantages, but the question as to whether or not the 6309 will catch on as a replacement microprocessor in privately owned CoCos remains unanswered. Further, no one can at this time be certain there are not undiscovered disadvantages (or more advantages) to such replacement. THE RAINBOW intends to follow this subject closely, and you can expect much discussion of the 6309 to take place in my "CoCo Consultations" column.

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of THE RAINBOW's CoCo SIG. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

Is the 6309 for OS-9 Only?

To take advantage of the 6309's features under OS-9 Level II, one need only update the operating system's modules. Because of OS-9's modularity, performance increases starting at this level are automatically reflected elsewhere — by applications software. This is not so under Disk BASIC because Disk BASIC software spends most of its execution time in its own code. Also, the patches developed so far for Disk BASIC use only the emulation mode and are somewhat limited in benefit.

It is possible to take advantage of the 6309's native mode by entering a few simple pokes, and you can gain the benefit of, perhaps, a 15-percent increase in throughput. However, unless you also change the interrupt routines in Disk BASIC, the system will crash with any attempt to execute sound functions, send or receive data through the rear serial port or perform disk I/O.

Once such patches are in place, though, it should be possible to write machine-language programs to fully use the power built into the 6309. In support of this, Bill Vergona (of Cer-Comp, Ltd.) has been working diligently on an assembler specifically designed for use with the 6309 microprocessor. At press-time, Bill said the assembler is 95-percent complete. He expects it to retail for $59.95, the same price as Cer-Comp's existing assembler for the CoCo 1, 2 and 3. Once that project is finished, if enough interest in the 6309 (and software for it) exists, Bill will consider redesigning some of his products (specifically *CBASIC* and *Windows*) to take advantage of the 6309.

It will be interesting in the coming months to see if other software vendors follow suit, rewriting existing applications and building new ones for the 6309 (we are not currently aware of any others who have already patched commercial products). We imagine this, too, will depend on the amount of interest CoCo users show in the 6309.

PowerBoost From Cover

patches them. It notes when it finds a module that should be patchable but isn't (due to the module being different, custom or absent).

The product I saw in Chicago is ready for shipment, but is in its infancy. Chris has patches (of course) for the hard disk drivers for the Burke & Burke CoCo-XT interface. He says he plans to work on similar patches for the RGB and Disto hard-drive code. Eventually Chris hopes to have patches for other hard-drive systems, for the OS-9 assembler and other aspects of the system. Chris does not at this time anticipate patching the C compiler, but hopes the information he will supply through his soon-to-be-released book about the 6309 will permit other dedicated programmers to update the C library for optimized use with a 6309.

Most important of all, the current set of patches use only the extra instructions available while the 6309 is in the 6809 emulation mode. He hopes to have more advanced patches available in the near future that will take advantage of the native mode. Chris also hopes to have out in the near future patches to the graphics modules that should massively speed up data transfers performed by them.

Those desiring a power boost for their CoCo 3 OS-9 systems need not, however, wait for the later improvements of the product. Burke & Burke has a very generous policy for updating old versions of the product with new releases when they are available — the charge is expected to be something like $5 for the upgrade.

What exactly does all this translate to in terms of the speed at which work-a-day OS-9 application software is executed? This will of course depend on how much the software you use makes use of system functions that are speeded up by the PowerBoost patches. Programs that intensively use the hard drive and RAM disk should show dramatic speed increases, perhaps 50 percent or more. Other programs might not show much noticeable speed increase. Overall, however, based on my limited look at the product, I am quite convinced that those who install PowerBoost will see a significant increase in the speed of their OS-9 systems.

What about compatibility? I suspect that these patches won't make a system any less compatible with an ordinary OS-9 application. I can imagine some unusual programs that depend on recognizing a byte for byte sequence that PowerBoost has patched, resulting in failure when PowerBoost is installed. I doubt this will often be a problem, though. Indeed, should PowerBoost catch on in a big way (as I suspect it will), it is likely that authors of OS-9 application programs will release patches for their applications to further increase the utility of the PowerBoost kit.

PowerBoost and BASIC?

I have so far sidestepped the issue of the 6309's advantages under BASIC. In my opinion, PowerBoost is currently a product solely for OS-9 users, although I have not yet seen the patches included for Disk BASIC in the PowerBoost kit. According to Chris, the patches he has made for Disk BASIC (at the time of this writing) make only a small speed difference.

A CoCo 3 with a 63B09E installed will run BASIC just fine. And in theory, patches similar to those for OS-9 could be made to Disk BASIC (the same way ADOS 3 currently patches the system). However, I imagine such patches would be of little significance in most cases because most Disk BASIC software spends most of its time in its own code and very little time calling Disk BASIC routines. Thus, to effectively use a 6309 with Disk BASIC programs, you'd have to have individual patches for each application program.

Those who want to experiment with the 6309's native mode under Disk BASIC can try poking the Hex values $11 $3D $01 $39 into a USER function, then executing it. Chris Burke says you should see about a 15-percent overall speed increase. However, be sure *not* to use disk I/O or output to the printer or other serial device via the 4-pin bit-banger port — the changes in instruction cycle counts for the code messes up those functions. It should also be possible to significantly enhance BASIC graphics programs by rewriting parts of the graphics code in the BASIC ROMs to use the more efficient data-transfer operations of the 6309.

The Hardware Aspect

Replacing the CoCo 3's 68B09E with the PowerBoost's 63B09E is not a trivial matter; the 68B09E chip is soldered directly to the delicate double-sided CoCo 3 circuit board, and replacement involves signficant hardware skill. The PowerBoost instructions detail two approaches to the replacement: desoldering the 68B09E and destructive removal. I prefer the latter approach, as a clean removal with an unharmed PC board is far more easily achieved than with the former approach. [*Editor's Note: Shortly before this issue went to press, Chris Burke circulated on Delphi and elsewhere a document describing a third approach. This method involves piggybacking the socket on the existing 68B09E, then installing the 63B09E. With this tactic, you can choose to totally disable the 6809, or you can install a switch that enables you to select between the 6809 and the 6309. Best of all, this approach does not require that you remove the existing 6809, though the installation still requires hardware skills.*]

Whichever method you choose, after the 68B09E is removed, you proceed to install the 40-pin socket included with PowerBoost. Once the socket is installed, you can install the 63B09E and be on your way.

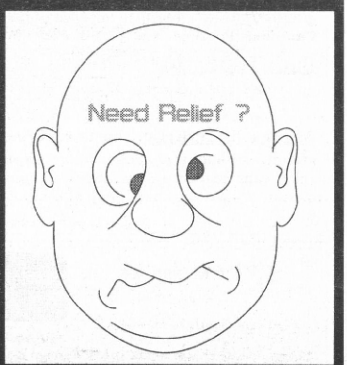
Those folks with 1- or 2-Meg upgrades will have to be especially creative when installing the PowerBoost, as the memory upgrade is already soldered to the 68B09E. The quickest way to handle this would be to desolder the memory board from the existing 68B09E chip, install the socket, then solder the the memory board to the 63B09E chip and plug *that* into the socket.

A far more elegant, reliable and easy-to-service approach would involve constructing a circuit board with a socket on it for the 63B09E chip, with pins coming out from the bottom of the socket under the PC board in a way that allows them to be plugged into yet another socket. Then bend out the two rows of pins from the memory board that formerly would be soldered directly to the CPU chip and let them straddle the socket on the top of your satelite board. Finish by wiring them to each pin of that socket.

Burke & Burke sells the PowerBoost kit with the current sets of patches for a remarkably generous $29.95. If you are a heavy-duty hacker and have a 63B09E lying around, Burke & Burke will sell you PowerBoost without the 63B09E for $25. (Note that $5 for a 63B09E is a very reasonable price, so if you do *not* have a 63B09E lying around right now, I urge you to buy it as part of the PowerBoost kit.) In addition, you can purchase extra 63B09E chips from Burke & Burke for $5.

It has been my intent in this review to provide sober solid facts concerning concerning PowerBoost. However, I must make a confession: I have for years had the very highest personal regard for Chris Burke. He impresses me as an exceptionally creative and competent software and hardware designer, and as an outstandingly decent, generous person. I believe his contributions to the Color Computer Community have been among the most significant. I urge OS-9 users who are interested in squeezing greater power out of their CoCo 3 OS-9 system to strongly consider buying PowerBoost. Let's all support those who continue to provide new, innovative products for this beloved machine. (*Burke & Burke, P.O. Box 733, Maple Valley, WA 98038, 206-432-1814; $29.95 plus $4 S/H.*)

— Marty Goodman



SEE THE NEXT PAGE

The Assembly Line

$$x - (x^2 - 2)/2$$

FIND YOUR ROOTS

$$x^2 - 2 = 0$$

Contrary to the image that may have formed in your mind upon reading the title above, this month's installment deals not with geneology but with determining the roots of an equation (at what points the function equals zero). This is one of the oldest problems in mathematics. While there is no one method that always produces correct results, there are several popular methods that eventually solve equations to a reasonable degree. In this article I'll discuss just one of these methods and use graphics to demonstrate the results.

The Newton/Raphson method of determining roots starts with an approximation (or guess) of the correct answer and keeps applying an iteration formula to the original value to produce new approximations. These new values will either approach one of the roots, bound off to infinity or oscillate between two values. (A computer program can include checks to weed out the last two cases.) The formula simply states that a better value is equal to the previous value, minus the function divided by it's derivative. (The derivative of Ax^n is nAx^{n-1}; for example, the derivative of x^2 is $2x$.)

Let's try a quick example and solve the equation $x^2-2=0$ using an approximation of 1 for an answer. The method says that a better guess is $x-(x^2-2)/2x$ or, rearranging terms $(x^2+2)/2x$. Trying our guess of 1 yields a new value of 1.5. Using this value in the same equation we get a better value of 1.42; substituting again produces 1.414. Each successive step gets us closer to the answer. So when do we stop?

At the beginning of any program for determining roots, you need to define a tolerance value. When the absolute difference between two successive results is less than the tolerance, stop; that's close enough to the answer.

Now suppose we had used -1 as our guess. This time the results would approach -1.414. As your equation gets more complicated you can't predict what initial value will lead to which root. How many times you want to keep iterating is up to you. I stop after 50 times since most values have reached a root by then (except for the ones that oscillate). And since division is involved, we'll always have to ensure the demoninator (the derivative) is never zero.

On With the Program

I decided to show the results of root determination graphically based on how long it takes a value to reach a root. Since my program uses PMODE4 with only two colors, I have it plot a point only when it reaches a root and the iteration count is even. This gives the illusion of a contour map. The BASIC program shown in Listing 1 is a short demonstration that graphs the roots of the equation $x^2-255x+14450$. When you run it, you'll see that some values produce a root very quickly while others take much longer. But that's just a one-dimensional graph. How can we use a y axis and get a two-dimensional contour map?

In previous articles in which we discussed the Mandelbrot and Julia sets, we solved this problem using complex numbers; because they're two-dimensional, they fit right into our root-solving equation. (Try to solve $x^2+1=0$ using our present method!)

A complex number Z is made up of a real part x and an imaginary part yi (i represents the square root of -1). Now let's try to solve $Z^2+2=0$ with a guess of $x=1$ and $yi=1$. Our better guess for Z will be $(Z^2-2)/2Z$. Since $Z=x+yi$, this reduces to $((x^2-y^2-2)+2xyi)/(2x+2yi)$, a complex number divided by another complex number. To save you time, a complex number $A+Bi/C+Di$ results in a new real number of the form $(AC+BD)/(CC+DD)$ and a new imaginary number of $i(BC-AD)/(CC+DD)$.

This division gives us a new real number (RR=0) and a new imaginary number (II=1) which should be closer to the correct solution. We have to compare the differences between the old and new *real* numbers and the old and new *imaginary* numbers. If each is less than the tolerance (I use .0001) then Z_{new} is a root of the equation. Using these new values, a better result is RR=0 and II=1.5. RR will continue to equal zero while II will approach a root.

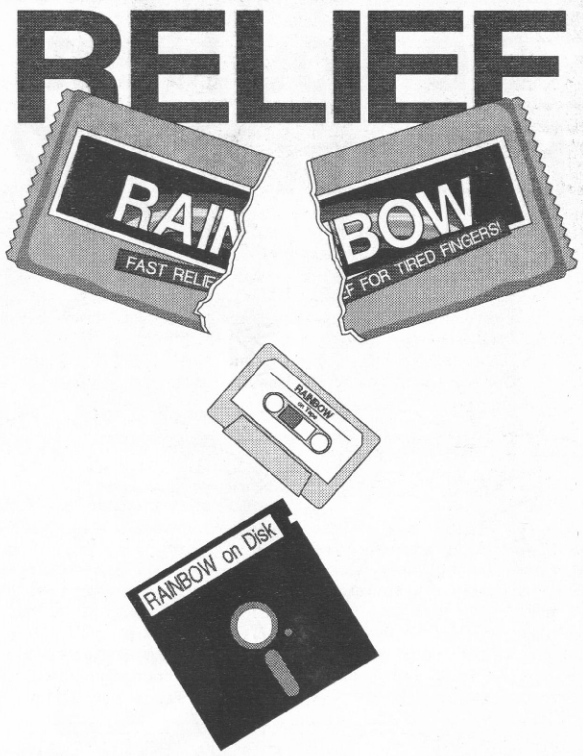
To graphically demonstrate this procedure, the program checks all the values between, for example, -1 and +1 in the real (x) direction and -1 and +1 in the imaginary (y) direction. Each point is be iterated up to 50 times. Whenever the parts of a Z_{new} are almost the same as the Z_{old}, the point is set if the iteration count is even. The machine-language program shown in Listing 3 carries this out using a few short-cuts, which are explained in the source code. After you've entered the assembly-language listing, save it using `W ROOTS.ASM` and assemble it using `A ROOTS.BIN /NS/WE`.

The BASIC program shown in Listing 2 reads your equation and pokes the necessary values into the correct locations. Save this program as `ROOTS.BAS`. Since the program can graph up to fifth-degree equations, be sure to fill in the blank coefficients with zeros. Follow the six coefficients with the starting x coordinate, the total x distance, the starting y coordinate and the total y distance. The program asks if you want a small (64-by-64), medium (128-by-128) or large (255-by-191) display.

In DATA statements, I've included some equations you might try. Notice that I used the `MKN$()` command instead of `VARPTR()`; in this way, we don't have to define variables at the beginning of the program.

Don't look for any great speed in this type of program; with up to 50 iterations per point and over 49,000 points, it takes a while to draw. I would put the high-speed poke in Line 220 and the normal-speed poke at the end of Line 230. Use the smaller (faster) display first to find an equation you like, then use the medium or large setting to increase it. You can zoom in on a portion by changing the x and y locations and dis-

(Continued)



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tances. You might want to add to this program the zoom routine from my article about Julia sets (February 1991, Page 30).

Bill Nee bucked the snowbird trend by retiring to Wisconsin from a banking career in Florida. The success of his 13-part series, "Machine Language Made BASIC" (July 1988 to July 1989), prompted him to continue writing articles about Color Computer machine-language programming. You may contact Bill at Route 2, Box 216C, Mason, WI 54856-9302, (715) 746-2952. Please include an SASE when requesting a reply.

64K Disk

Listing 1: BASROOTS

```
10 PMODE4,1:PCLS:SCREEN1,1
20 FOR X=0 TO 255:A=X
30 FOR Z=0 TO 50
40 DE=2*A-255:IF DE=0 THEN 90
50 RR=A*A-14450
60 AA=RR/DE
70 IF ABS(A-AA)<.0001 THEN 100
80 A=AA:NEXT Z
90 NEXT X
99 GOTO 99
100 LINE(X,96)-(X,96-8*Z),PSET
110 GOTO 90
```

Listing 2: ROOTS

```
10 CLEAR200,&H6000
20 IF PEEK(&H60AD)<>204 THEN LOA
DM"ROOTS":POKE&HFF40,0
30 CLS:PRINT" SIZE OF DISPLAY -"
," <S>mall","  <M>edium","   <
L>arge"
40 A$=INKEY$:IF A$="" THEN 40
50 IF A$="S" THEN SX=64:SY=64
60 IF A$="M" THEN SX=128:SY=128
70 IF A$="L" THEN SX=256:SY=192
80 READ N:POKE&H6000,N:'DEGREE O
F EQUATION
90 READ C5:A=C5:LO=&H6067:GOSUB3
20
100 READ C4:A=C4:LO=&H606C:GOSUB
320
110 READ C3:A=C3:LO=&H6071:GOSUB
320
120 READ C2:A=C2:LO=&H6076:GOSUB
320
130 READ C1:A=C1:LO=&H607B:GOSUB
320
140 READ C0:A=C0:LO=&H6080:GOSUB
320
150 READ XC:A=XC:LO=&H600E:GOSUB
320:READ XD
160 READ YC:A=YC:LO=&H6018:GOSUB
320:READ YD
170 XS=XD/SX:A=XS:LO=&H6013:GOSU
B 320:IF A$="L" THEN SX=SX-1
180 YS=YD/SY:A=YS:LO=&H601D:GOSU
B 320:IF A$="L" THEN SY=SY-1
190 POKE&H6022,0:POKE&H6023,SX
200 POKE&H6024,0:POKE&H6025,SY
210 PMODE4,1:COLOR0,5:PCLS:SCREE
N1,1:POKE&HB5,0
220 'YOUR FAST POKE
230 EXEC &H60AD:'SLOW POKE
240 GOTO 240
250 DATA 3,0,0,4,0,-3,0,-1,2,-1,
2
260 'DATA 3.0,0,1.0,0,-1,-1,2,-1
,2
270 'DATA 4,0,5,4,3,2,1,-1,2,-1,
2
280 'DATA 4,0,5,4,3,2,1,-.7,.5,-
2,1
290 'DATA 4,0,8,0,-8,0,1,-1,2,-1
,2
300 'DATA 5,1,0,0,0,0,1,-2,4,-2,
4
310 'DATA 5,16,0,-20,0,5,0,-1,2,
-1,2
320 Z$=MKN$(A)
330 FOR N=1 TO 5:POKE LO+N-1,ASC
(MID$(Z$,N,1)):NEXT:RETURN
```

Listing 3: ROOTS

```
00100 ADD     EQU     $B9C2
00110 SUB     EQU     $B9B9
00120 MUL     EQU     $BACA
00130 DIV     EQU     $BB8F
00140 X1      EQU     $BE
00150 Y1      EQU     $C0
00160
00170 MOVE    MACRO
00180         LDD     \0
00190         STD     \1
00200         LDD     \0+2
00210         STD     \1+2
00220         LDB     \0+4
00230         STB     \1+4
00240         ENDM
00250
00260 ZEROIT  MACRO
00270         LDD     #0
00280         LDX     #R1     CLEAR R1,I1,R2,I2
00290         STD     ,X++
00300         STD     ,X++
00310         STD     ,X++
00320         STD     ,X++
00330         STD     ,X++
00340         STD     ,X++
00350         STD     ,X++
00360         STD     ,X++
00370         STD     ,X++
00380         STD     ,X
00390         ENDM
00400
00410 COMP    MACRO
00420         LDX     #\0
00430         JSR     $BC14
00440         LDX     #\1
00450         JSR     SUB
00460         LDA     $4F     EXPONENT
00470         CMPA    #114
00480         BHI     \2      NOT WITHIN TOLERANCE
```

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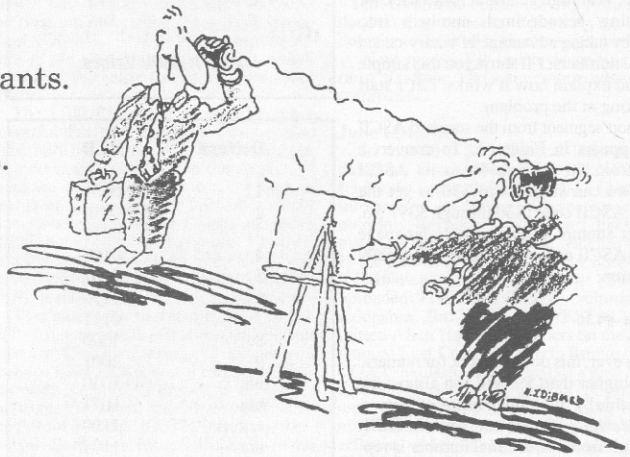

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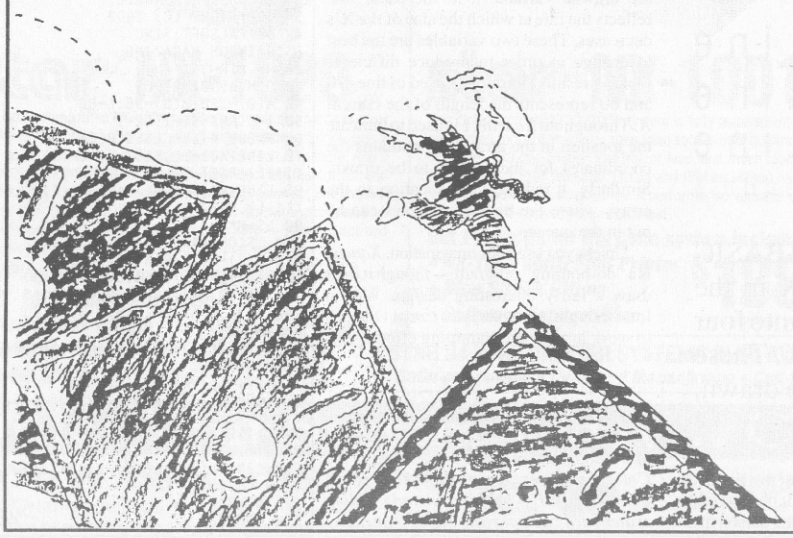

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```
00490          ENDM
00500
00510 TERM1    MACRO
00520 *ALL REAL TERMS
00530          LDX     #\1
00540          JSR     $BC14
00550          LDX     #\2
00560          JSR     MUL
00570          LDX     #\0
00580          JSR     $BC35
00590          LDX     #\3
00600          JSR     $BC14
00610          LDX     #\4
00620          JSR     MUL
00630          LDX     #\0
00640          JSR     SUB
00650          LDX     #\0
00660          JSR     $BC35
00670          ENDM
00680
00690 TERM2    MACRO
00700 *ALL EVEN IMAGINARY TERMS
00710          LDB     #2
00720          JSR     $BC7C
00730          LDX     #\1
00740          JSR     MUL
00750          LDX     #\2
00760          JSR     MUL
00770          LDX     #\0
00780          JSR     $BC35
00790          ENDM
00800
00810 TERM3    MACRO
00820 *ALL ODD IMAGINARY TERMS
00830          LDX     #\1
00840          JSR     $BC14
00850          LDX     #\2
00860          JSR     MUL
00870          LDX     #\0
00880          JSR     $BC35
00890          LDX     #\3
00900          JSR     $BC14
00910          LDX     #\4
00920          JSR     MUL
00930          LDX     #\0
00940          JSR     ADD
00950          LDX     #\0
00960          JSR     $BC35
00970          JSR     $BC35
00980          ENDM
00990
01000 TERM4    MACRO
01010 *PART OF ALL TERMS
01020          COND    NARG=4
01030          LDB     #\1
01040          JSR     $BC7C
01050          LDX     #\2
01060          JSR     MUL
01070          LDX     #\3
01080          JSR     MUL
01090          ENDC
01100          COND    NARG=3
01110          LDX     #\1
01120          JSR     $BC14
01130          LDX     #\2
01140          JSR     MUL
01150          ENDC
01160          LDX     #\0
01170          JSR     ADD
01180          LDX     #\0
01190          JSR     $BC35
01200          ENDM
01210
01220 EVEN     MACRO
01230          LDB     \0
01240          BITB    #1
01250          BNE     \1
01260          ENDM
01270
01280 PSET     MACRO
01290          LDB     \0+1
01300          STB     X1
01310          LDB     WID+1
01320          SUBB    \1+1
01330          STB     Y1
01340          JSR     $9374
01350          ENDM
01360
01370          ORG     $6000
01380 NN       FCB     3
01390 N1       FCB     2
01400 TIMES    RMB     1
01410 ACROSS   RMB     2
01420 DOWN     RMB     2
01430 MISC     RMB     2
01440 ZERO     FDB     0
01450          FDB     0
01460          FCB     0
01470 XCORN    RMB     5
01480 XSCALE   RMB     5
01490 YCORN    RMB     5
01500 YSCALE   RMB     5
01510 LEN      RMB     2
01520 WID      RMB     2
01530 XX       RMB     5
01540 AA       RMB     5
01550 BB       RMB     5
01560 R1       RMB     5
01570 I1       RMB     5
01580 R2       RMB     5
01590 I2       RMB     5
01600 DE       RMB     5
01610 RR       RMB     5
01620 II       RMB     5
01630 TEMP     RMB     5
01640 C7       RMB     5
01650 C6       RMB     5
01660 C5       RMB     5
01670 C4       RMB     5
01680 C3       RMB     5
01690 C2       RMB     5
01700 C1       RMB     5
01710 C0       RMB     5
01720 RT2      RMB     5
01730 IT2      RMB     5
01740 RT3      RMB     5
01750 IT3      RMB     5
01760 RT4      RMB     5
01770 IT4      RMB     5
01780 RT5      RMB     5
01790 IT5      RMB     5
01800
01810 START    LDD     #0
01820 L1       STD     ACROSS
01830          JSR     $B4F4
01840          LDX     #XSCALE
01850          JSR     MUL
01860          LDX     #XCORN
01870          JSR     ADD
01880          LDX     #XX
01890          JSR     $BC35   XX=XC+H*XS
01900
01910          LDD     #0
01920 L2       STD     DOWN
01930          JSR     $B4F4
01940          LDX     #YSCALE
01950          JSR     MUL
01960          LDX     #YCORN
01970          JSR     ADD
01980          LDX     #BB
01990          JSR     $BC35   BB=YC+V*YS
02000          MOVE    XX,AA   AA=XX
02010
02020          LDB     #50     ITERATION COUNT
02030          STB     TIMES
02040 L3       ZEROIT
02050
02060 GETRT2   TERM1   RT2,AA,AA,BB,BB
02070 GETIT2   TERM2   IT2,AA,BB
02080 GETRT3   TERM1   RT3,AA,RT2,BB,IT2
02090 GETIT3   TERM3   IT3,AA,IT2,BB,RT2
02100 GETRT4   TERM1   RT4,RT2,RT2,IT2,IT2
02110 GETIT4   TERM2   IT4,RT2,IT2
02120 R1A      TST     C5
02130          BEQ     R1B     SKIP IF NOT 5TH DEGREE
02140 GETRT5   TERM1   RT5,RT2,RT3,IT2,IT3
02150 GETIT5   TERM3   IT5,RT2,IT3,RT3,IT2
02160          TERM4   R1,4,C5,RT5
02170 R1B      TST     C4
02180          BEQ     R1C
02190          TERM4   R1,3,C4,RT4
02200 R1C      TST     C3
02210          BEQ     R1D
02220          TERM4   R1,2,C3,RT3
02230 R1D      LDX     #C2
02240          JSR     $BC14
02250          LDX     #RT2
02260          JSR     MUL
02270          LDX     #R1
02280          JSR     ADD
02290          LDX     #C0
02300          JSR     SUB     NEGATIVE SUBTRACTION
02310          COM     $54      SO REVERSE THE SIGN
02320          LDX     #R1
02330          JSR     $BC35
02340          LDA     R1      EXPONENT OF R1
02350          CMPA    #184
02360          LBHI    L5      TOO LARGE TO CONTINUE
02370 I1A      TST     C5
02380          BEQ     I1B
02390          TERM4   I1,4,C5,IT5
02400 I1B      TST     C4
02410          BEQ     I1C
02420          TERM4   I1,3,C4,IT4
02430 I1C      TST     C3
02440          BEQ     I1D
02450          TERM4   I1,2,C3,IT3
02460 I1D      TERM4   I2,C2,IT2
02470          LDA     I1
02480          CMPA    #184
02490          LBHI    L5
02500 R2A      TST     C5
02510          BEQ     R2B
02520          TERM4   R2,5,C5,RT4
02530 R2B      TST     C4
02540          BEQ     R2C
02550          TERM4   R2,4,C4,RT3
02560 R2C      TST     C3
02570          BEQ     R2D
02580          TERM4   R2,3,C3,RT2
02590 R2D      LDB     #2
02600          JSR     $BC7C
02610          LDX     #C2
02620          JSR     MUL
```

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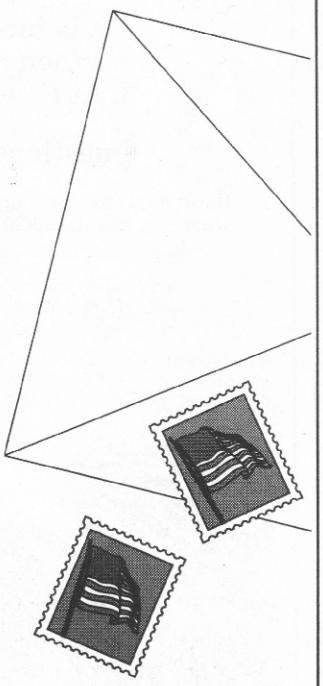

```
02630           LDX     #AA
02640           JSR     MUL
02650           LDX     #R2
02660           JSR     ADD
02670           LDX     #C1
02680           JSR     ADD
02690           LDX     #R2
02700           JSR     $BC35
02710           LDA     R2
02720           CMPA    #184
02730           LBHI    L5
02740 I2A       TST     C5
02750           BEQ     I2B
02760           TERM4   I2,5,C5,IT4
02770 I2B       TST     C4
02780           BEQ     I2C
02790           TERM4   I2,4,C4,IT3
02800 I2C       TST     C3
02810           BEQ     I2D
02820           TERM4   I2,3,C3,IT2
02830 I2D       TERM4   I2,2,C2,BB
02840           LDA     I2
02850           CMPA    #184
02860           LBHI    L5
02870
02880 GETDE     LDX     #R2     COMPUTE THE DENOMINATOR
02890           JSR     $BC14
02900           LDX     #R2
02910           JSR     MUL
02920           LDX     #DE
02930           JSR     $BC35
02940           LDX     #I2
02950           JSR     $BC14
02960           LDX     #I2
02970           JSR     MUL
02980           LDX     #DE
02990           JSR     ADD
03000           LDX     #DE
03010           JSR     $BC35   DE=R2*R2+I2*I2
03020           LDA     $4F     DENOMINATOR'S EXPONENT
03030           LBEQ    L5      BRANCH IF ZERO
03040 *         CMPA    #152    OPTIONAL CHECK
03050 *         LBHS    L5       TO SEE IF TOO LARGE
03060
03070 GETRR     LDX     #DE     COMPUTE NEW REAL TERM
03080           JSR     $BC14
03090           LDX     #R1
03100           JSR     DIV
03110           LDX     #R2
03120           JSR     MUL
03130           LDX     #RR
03140           JSR     $BC35
03150           LDX     #DE
03160           JSR     $BC14
03170           LDX     #I1
03180           JSR     DIV
03190           LDX     #I2
03200           JSR     MUL
03210           LDX     #RR
03220           JSR     ADD
03230           LDX     #RR
03240           JSR     $BC35   RR=R1*R2+I1*I2
03250
03260 GETII     LDX     #DE     COMPUTE NEW IMAGINARY TERM
03270           JSR     $BC14
03280           LDX     #R2
03290           JSR     DIV
03300           LDX     #I1
03310           JSR     MUL
03320           LDX     #II
03330           JSR     $BC35
03340           LDX     #DE
03350           JSR     $BC14
03360           LDX     #R1
03370           JSR     DIV
03380           LDX     #I2
03390           JSR     MUL
03400           LDX     #II
03410           JSR     SUB
03420           LDX     #II
03430           JSR     $BC35   II=R2*I1-R1*I2
03440
03450 TESTA     COMP    AA,RR,L4        COMPARE REAL OLD AND NEW
03460           COMP    BB,II,L4        COMPARE IMAGINARY OLD AND NEW
03470           EVEN    TIMES,L5
03480           PSET    ACROSS,DOWN
03490           BRA     L5
03500 L4        MOVE    RR,AA   AA NOW = RR
03510           MOVE    II,BB    AND BB=II
03520           DEC     TIMES
03530           LBNE    L3
03540
03550 L5        LDD     DOWN
03560           ADDD    #1
03570           CMPD    WID
03580           LBLS    L2
03590           LDD     ACROSS
03600           ADDD    #1
03610           CMPD    LEN
03620           LBLS    L1
03630           RTS
03640
03650           END     START
```


PHOTON

The critics will be **raving** about this strategy game! Based on an original concept by author Jeff Steidel, *Photon* is an addictive time-muncher in the spirit of *Lemmings*™ and *Tetris*™. Match wits with Ludevide, the evil power droid, as you reason your way through over 60 devious levels. The numerous original music scores, digitized speech and sound effects, and pleasing animation and graphics enrich *Photon* to make it an unparalleled gaming experience. Soon to be released on a variety of computer platforms, the CoCo Community is lucky enough to be given first glance at this fantastic game! Req. 128k CoCo-3, disk drive, and joystick.

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Are You Lost???

That's right... are you at a loss when it comes to what's out there in the CoCo Market? Do you feel like you are disconnected from the new 68xxx machines? If you are interested in the latest, new products for the CoCo and the 'newer breed' of machines, write to us at the address below and we'll put you on our mailing list so that you can get the scoop on all the great new products coming out for your favorite machines.

JWT Enterprises
5755 Lockwood Blvd.
Youngstown, OH 44512

Feature Program

GraphIt

Offers Functional Snapshots

Have you ever been doing your math homework and found yourself thinking, "If only I could see a graph of that equation . . .?" So you pull out some graph paper and get to work — whew! *GraphIt* is a CoCo 3 program that takes care of the tedious part for you. *GraphIt* can plot virtually any function in terms of *x* and *y* in which *y* has been "solved for." (Such a function is in the form $y=f(x)$.)

Enter the program as listed, then save it to tape or disk before running it. As written, *GraphIt* is designed for use with an RGB monitor. The display colors may be different when the program is used with a color composite monitor. When you enter `RUN`, you'll see the title screen and be prompted to choose whether you want the graph drawn using vectors or points only. If you press P, integral solutions to the function are plotted. Selecting the Vector option results in a graph using the straightest possible lines between consecutive solutions, giving an estimation of how the non-integral solutions would appear. This may distort the resulting graph in some cases but can be very useful at times.

At the second prompt you are asked whether or not you want a background grid. If you press Y, a 10-by-10-pixel grid is drawn in pale green. Generally such a background is helpful as it puts the graph in a frame of reference. In conjunction with the Points Only option, however, it may be a source of eyestrain. In either case, the *x* and *y* axes are drawn in black at the center of the screen. The graph of the function appears in red.

You may find it helpful to graph the funtion using both vectors and points, and with and without the grid. Press ENTER after the graph is drawn to return to the title screen, at which point you can graph the function again using different selections.

The function to be graphed is stored in Line 650. You can modify this line to graph nearly any equation. The allowable range (*x* values) is -160 through 160, and the domain (*y* values) is -96 through 96. Each pixel represents one integral increment on the coordinate plane.

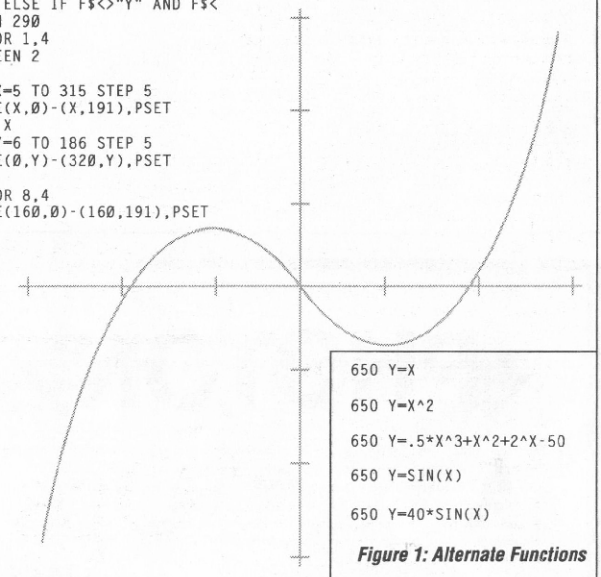
I've included several functions you might want to use for experimenting with *GraphIt* (see Figure 1). When entering an equation, always remember to use an asterisk (*) for multiplication, a slash (/) for division and an up arrow to raise *x* to a power. Experiment with algebraic equations such as lines (`Y=M*X+B`), parabolas (`Y=A*X^2+B*X+C`) and trigonometric functions (`SIN`, `COS` and `TAN`).

Rick St. John began writing programs for the Color Computer when he was in the third grade. He is currently a junior at Stanford University and is majoring in political science. Rick can be contacted at 2131 Glacier Lane, Santa Maria, CA 93455. Please include an SASE when requesting a reply.

CoCo 3

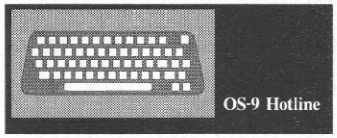
The Listing: `GRAPHIT`

```
10 'GRAPHIT
20 'BY RICK ST. JOHN
30 'COPYRIGHT (C) 1992
40 'BY FALSOFT, INC.
50 'RAINBOW MAGAZINE
100 RGB:WIDTH40:CLS5:POKE65497,0
110 PALETTE9,8:PALETTE1,58
120 ATTR1,4
130 LOCATE7,2:PRINT"St. John Sof
tware Presents..."
140 LOCATE16,5:PRINT"-GRAPHIT-"
150 LOCATE12,8:PRINT"Copyright (
C) 1988"
160 LOCATE13,10:PRINT"By Rick St
. John"
170 ATTR7,4,B
180 LOCATE13,17:PRINT"V - Vector
"
190 LOCATE13,19:PRINT"P - Points
 only";
200 ATTR3,4
210 PRINT
220 ATTR1,4
230 F$=INKEY$:IF F$="V" OR F$="v
" THEN V=1 ELSE IF F$="P" OR F$=
"p" THEN V=0 ELSE 230
240 ATTR7,4,B
250 LOCATE13,17:PRINT"  Grid? (y
/n)"
260 ATTR3,4
270 PRINT:PRINT
280 ATTR1,4
290 F$=INKEY$:IF F$="N" OR F$="n
" THEN HCOLOR 1,4:HSCREEN 2:CLS:
GOTO 390 ELSE IF F$<>"Y" AND F$<
>"y" THEN 290
300 HCOLOR 1,4
310 HSCREEN 2
320 CLS
330 FOR X=5 TO 315 STEP 5
340 HLINE(X,0)-(X,191),PSET
350 NEXT X
360 FOR Y=6 TO 186 STEP 5
370 HLINE(0,Y)-(320,Y),PSET
380 NEXT
390 HCOLOR 8,4
400 HLINE(160,0)-(160,191),PSET
410 HLINE(0,96)-(320,96),PSET
420 HCOLOR 3,4
430 FOR X=-160 TO 0
440 GOSUB 650
450 IF Y=999 THEN 470 ELSE D$="B
M"+STR$(160+X)+","+STR$(INT(96+Y
))
460 DRAW D$:G=X:GOTO 480
470 NEXT X
480 FOR X=G TO 0
490 GOSUB 650
500 IF Y=999 THEN 520
510 IF V=1 THEN HLINE-(160+X,96+
Y),PSET ELSE HSET(160+X,96+Y,7)
520 NEXT X
530 FOR X=0 TO 160
540 GOSUB 650
550 IF Y=999 THEN 570
560 IF V=1 THEN HLINE-(160+X,96+
Y),PSET ELSE HSET(160+X,96+Y,7)
570 NEXT X
580 POKE 65496,0
590 F$=INKEY$:IFF$=CHR$(13) THEN
 RUN ELSE 590
600 '*************************
610 '*REPLACE LINE 650 WITH AN*
620 '*EQUATION IN TERMS OF Y&X*
630 '*EX: 650 Y=.025*X^2+X-80 *
640 '*************************
650 Y=90*SIN(300*X)
660 Y=-1*Y
670 IF Y+96<0 OR X+160<0 OR Y+96
>191 OR X+160>320 THEN Y=999
680 RETURN
```



```
650 Y=X

650 Y=X^2

650 Y=.5*X^3+X^2+2^X-50

650 Y=SIN(X)

650 Y=40*SIN(X)
```

Figure 1: Alternate Functions



Merging Shell

I would like to know how I can modify the modules merged with `shell`. *I would like to replace* `mdir` *and* `procs` *with* `dirm` *and* `proc`. *I have tried to merge* `shell` *and those two modules into another file, after renaming it to* `shell` *and deleting the original* `shell` *file. But when I reboot OS-9,* `mdir` *and* `procs` *are still there.*

Alain Pilon (APILON)
Brossard, Quebec
Canada

First you need access to the `save` command, which is included with the *OS-9 Development System* and also with *Multi-Vue*. To retrieve `save` from the *Multi-Vue* package, insert Disk 2 and load `pmpts` from the `CMDS` directory, then insert your boot disk and type `save /dd/cmds/save; attr /dd/cmds/save pe pw pr e w r`. Alternatively, you can download a version of `save` (written by Kevin Darling) from either Delphi or CompuServe. If none of these options suit your fancy, enter the `bsave.b09` program shown in Listing 1. Now boot OS-9, turn on the printer, and enter

```
ident -s /dd/cmds/shell >/p
```

This gives you a list of all the modules (programs) currently merged with `shell`. We suggest you create a temporary working directory to prevent the possibility of overwriting any files, so type:

```
makdir /dd/temp
chd /dd/temp
```

At this point you could save each module to a disk one at a time and then merge all the modules, although it's easier (and saves keystrokes) to let `save` do most of the grunt work for you. The general technique is to save the commands in small groups on disk, and then to merge all of the temporary files together. In your case you want to replace `mdir` and `procs` with `dirm` and `proc`, so begin by loading `dirm` and `proc`:

```
load dirm
load proc
```

Now save the first group on disk by typing:

```
save shell.1 shell attr cls ...
```

where the ellipsis (...) represents any other commands in your list. Note that `shell` must be the first module in the file, so it is included first in the list. You probably won't be able to fit all the modules on one command line, which is why we saved the first group to the file named `shell.1`. You can then save the second group of modules by typing:

```
save shell.2 merge proc rename ...
```

If you still aren't able to get all modules in two groups, continue using a third, fourth or however many it takes. Once all of the modules are saved, merge the resultant files and set the attributes:

```
merge shell.1 shell.2 >shell
attr shell pe pw pr e w r
```

Now you can copy the new shell file to your `CMDS` directory and reboot to make the changes active. Before doing this, however, we suggest first running `ident` to make sure the file is clean (all good CRCs and module headers). If you get any errors from `ident`, check the modules in memory to make sure they are clean, then start from scratch. Just to be extra safe, double check the attributes of the file after you copy it to the `CMDS` directory.

Note that if you use `bsave.b09`, you must save each module individually instead of in groups. For example, the commands used with `bsave` would be as follows:

```
bsave shell
bsave attr
```

```
bsave cls
bsave cmp
...
merge shell attr cls cmp >shell.1
...
rename shell shell.mod
merge shell.1 shell.2 >shell
rename /dd/cmds/shell shell.bak
copy shell /dd/cmds/shell
```

Since most of the modules are also available as separate files on disk, you may be able to merge them from disk rather than save them all first.

We send a big thanks to Randy Wilson (RANDYKWILSON) for providing bsave. When we asked on Delphi for ways OS-9 users could get a save command without having to buy the *Development System*, Randy mentioned the *Multi-Vue* trick, then quickly wrote bsave and offered it to us. While the program doesn't support saving of multiple modules in one file, it is extremely well-written and worthy of study by BASIC09 programmers. This, folks, is what the CoCo Community is all about.

Watch out for the BLOB

I am having trouble formatting disks with OS-9 Level II — I intermittently encounter Read errors (Error 244) during the format process. Some days I can format three or four disks with no problem, then the next disk bombs. On other days, my first attempt fails. To make matters worse, when I finally get a disk formatted and try to copy a file to it from my hard drive, the system gives me a write-verification error. Of course this, too, happens intermittently. Please help me before I go crazy.

Vic Roberts
Raleigh, North Carolina

We recently encountered similar difficulties with one of our CoCo 3 systems here, and we traced the problem to the infamous BLOB (boot-list order bug). According to Chris Burke of Burke & Burke, there are (at least) two theories about BLOB problems, the most prevalent of which is that certain device-driver and -descriptor modules need to be grouped and should reside just after an even 8K boundary after loading from the OS9Boot file.

Start OS-9 with the boot disk you ordinarily use. After you get to the OS9: prompt, enter mdir e to get a complete module directory. We suspect you'll find the disk modules (RBF, CC3Disk, d0, d1, your hard-disk driver, h0 and dd) spread apart and/or that they cross an 8K boundary ($2000, $4000, $6000, etc.).

To correct the problem, try using a program like *EZGen* (from Burke & Burke) or *KwikGen* (from Gale Force Enterprises) to alter the order of the modules in the OS9Boot file. Because we had just received the program for review and wanted to give it a run for its money, we used *KwikGen* (reviewed August 1992, Page 6). We first grouped the modules in the following order:

```
RBF
CC3Disk
d0
d1
BBFHdisk
h0
dd
```

Once the modules were grouped, we used *KwikGen*'s Address function and determined how to rearrange other modules so that the first disk module (RBF) would load into memory just after an even 8K boundary. Finally, we wrote the modified OS9Boot file to disk. We have not had a problem since.

To use *EZGen*, you would follow a similar procedure, though to determine where the modules are loading, you'll have to reboot with the modified disk and check the addresses with mdir e again. You may have to repeat this process several times before you get RBF properly positioned.

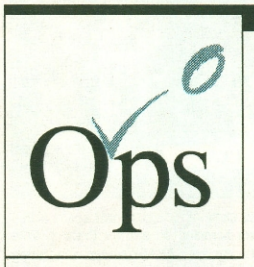
One final word of advice: Before you go about patching, boot the system with a copy of the original system disk from Tandy. Otherwise you take the chance of repeatedly encountering the same frustrating Write errors you are trying to eliminate.

Obtaining Telecommunications Packages

I'm working on trying to use OS-9 and also learning BASIC09. I have been subscribing to THE RAINBOW for a number of years, and I keep reading about all the information a person can get through the OS-9 SIG on Delphi. The question I have is how can a person acquire a good telecommunications program without having to spend a good deal of money? There are many good programs for Disk BASIC, but I haven't seen any in the same price range for OS-9. I'm talking about shareware programs. Please let me know, if you can, where I can order a program of this sort. Thank you very much for the OS-9 Hotline.

Eddie G. Wilson
Galax, Virginia

If you are willing to pay for quality software, you can purchase *KBCom* from CoCo PRO! (313-482-8128). *KBCom* is one of the best terminal programs ever written for OS-9, and its VT100 emulation is exceptional (even better than most terminal programs available for MS-DOS-based systems). If you don't want to pay for commercial software, *Supercomm* is included on the November 1991 RAINBOW ON DISK, which is available in back-issue form.



In the July 1992 installment of "OS-9 Hotline" (Page 17), we published a mod-patch script designed to set up 40-track drives under OS-9 Level II. Unfortunately we inadvertently swapped the old-byte and new-byte parameters for the step-rate change in this script. The three lines that read

```
c 14 03 00
```

should be changed to

```
c 14 00 03
```

We're sorry for the inconvenience, and we hope our mistake didn't cause too much confusion.

We should also note that the offset ($14) for the step-rate value is the same for all floppy-disk descriptors. You should be able to use this line to alter the step rate for any drive capable of stepping at 6ms.

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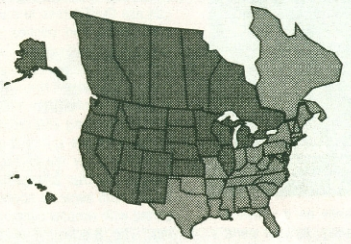

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OS-9 Level II

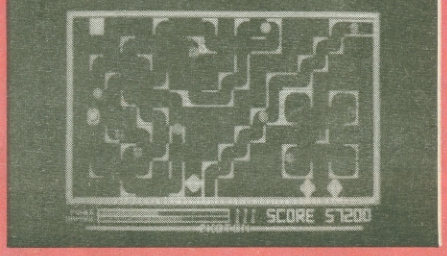
The Listing: bsave

```
PROCEDURE bsave
0000      (* Written by Randy K. Wilson
001D      (* 6/19/92
0028      (* Released to public domain 6/19/92
004C      (*
004F      (* Note that this procedure can only be used with modules less
008D      (* than 32K in size; 40K if RunB and SysCall are merged together
00CD      (*
00D0      (* Also note that due to the params needed, this procedure can
010E      (* only be used in "pack"ed form
012E
012F      PARAM file_name:STRING[64]
0138      PARAM mod_name:STRING
0142      TYPE stack=cc,a,b,dp:BYTE; x,y,u:INTEGER
0167      DIM regs:stack
0170      DIM I_Write:BYTE \I_Write=$8A
017F      DIM F_Link:BYTE \F_Link=$00
018E      DIM file_temp,mod_temp:STRING[64]
019E      DIM path:BYTE
01A5
01A6      (* Test for first param, and add a carriage return to it
01DE      (* If not there, go show usage
01FC      ON ERROR GOTO 100
0202      file_temp=file_name+CHR$(13)
020E
020F      (* Test for second param, and add a carriage return
0242      (* If not given, assume file and module are same name
0277      ON ERROR GOTO 200
027D      mod_temp=mod_name+CHR$(13)
0289
028A      (* Now ask the system to find the module and map it into
02C2      (* our space so that we can work with it
02EA      (* See F$Link, OS9 Tech Manual, p8-23
030F 50   ON ERROR
0315      regs.a=0 \(* 0 for type/language means "don't care"
0349      regs.x=ADDR(mod_temp)
0357      RUN syscall(F_Link,regs)
0366      (* Since Basic09 will not know about an error in SysCall, we
03A2      (* must manually check the Carry bit of the CC register
0309      IF LAND(regs.cc,1)=1 THEN
03EB        IF regs.b=221 THEN
03FA          PRINT "Module "; mod_name; " not found"
0416        ELSE
041A          PRINT "Error #"; regs.b; " while attempting to link to "
                ; mod_name
0450        ENDIF
0452        END
0454      ENDIF
0456
0457      (* Found the module, now open the file
047D      ON ERROR GOTO 300
0483      CREATE #path,file_temp
048D
048E      (* We now have the module, and a file to put it in, but how?
04CA      (* Since the module is not in a Basic variable, we can not
0504      (* just tell basic to write it for us. So we ask the system to
0542      (* do it for us.
0553      (* See I$Write, OS9 Tech Manual, p8-64
0579      ON ERROR
057C      regs.x=regs.u
0588      regs.a=path
0597      regs.y=PEEK(regs.x+2)*256+PEEK(regs.x+3)
05B9      RUN syscall(I_Write,regs)
05C8      (* And, again, manually check for error
05EF      IF LAND(regs.cc,1)=1 THEN
0601        PRINT "Error while writing to "; file_name; "."
0624        PRINT "Error #"; regs.b
0636      ENDIF
0638      CLOSE #path
063E      END
0640
0641 100  REM print usage/help
0657      PRINT "Usage: bsave <file name> <module name>"
0681      PRINT "                    or"
069B      PRINT "       bsave <module name>   uses same name for file"
0603      END
0605
0606 200  mod_temp=file_temp
06E1      GOTO 50
06E5
06E6 300  PRINT "Could not create file "; file_temp; "."
070B      END
```

SUNDOG SYSTEMS

PHOTON

NEW!



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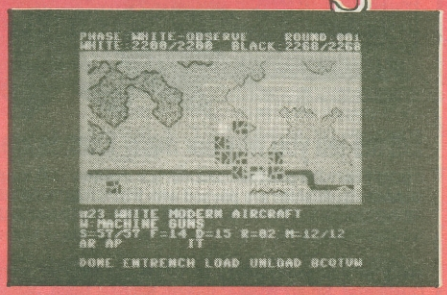
War Monger

NEW!



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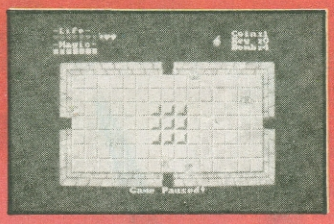

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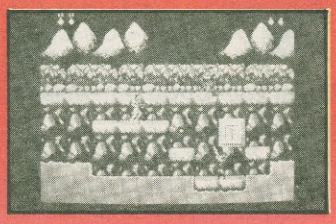

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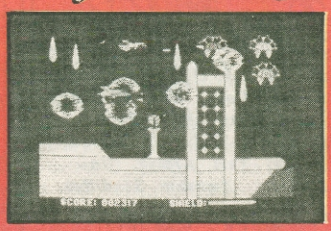

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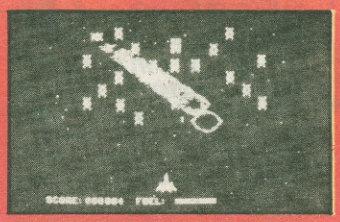

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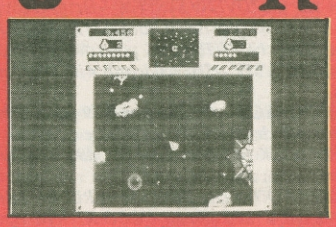

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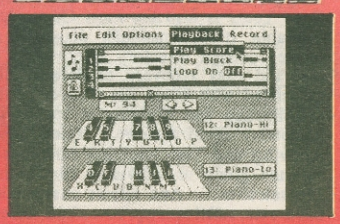

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